INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Vol. 22
No. 7

PUBLISHED MONTHLY BY THE BRUCE PUBLISHING COMPANY, 524-544 NORTH MILWAUKEE STREET, MILWAUKEE, WISCONSIN.
Eastern Office: 40 E. 34th St., New York, N. Y.— Western Office: 66 E. South Water St., Chicago, Ill.

CONTENTS

Industrial Education and Change, *by Clyde A. Bowman* 223
Printing by General-Shop Methods, *by Crawford Park* 227
Kinks for the Shop Teacher, *by William L. Hunter* 228
Editorials 230
Content of the Drafting Course, *by William P. Hale* 231
The Industrial-Arts Curriculum, *by W. C. Wilson* 232

Supplements

A Useful Transit, *by H. D. Campbell and J. W. Strahl* ..... No. 269
Toolmaker's Clamp or Vise, *by Alfred B. Grayshon* ..... No. 270

Problems and Projects

A Useful Transit, *by H. D. Campbell and J. W. Strahl* 233
Projects for Coördination, *by Edward A. Janning* 234
Toolmaker's Clamp or Vise, *by Alfred B. Grayshon* 235
Leather Book Cover, *by Ross C. Cramlet* 235
Footstools, *by C. Anthony Van Kammen* 235
A Fountain Pool, *by R. H. Jenkins* 238
Bird-Cage Bracket, *by H. M. Andersen* 239
Combination Hoe and Cultivator, *by F. M. Walter* 239
Use of Stains, *by P. S. Emerson* 239
A Lock Joint for Paper-Development Problems, *by E. M. Wyatt* 240
A Versatile Glider, *by Terence Vincent* 240
Circular Saws, Their Characteristics and Use —VI, *by John E. Doren* 242

Associations and Conventions 243
New Publications 2A
School Shop Equipment News 6A

VACATION DAYS

With conditions as they are this year, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION is almost afraid to wish its readers an enjoyable vacation. Nevertheless, man is so adaptable that his happiness depends more upon his mental attitude than upon exterior and extraneous conditions.

There is, of course, exceedingly little opportunity for obtaining employment which would help to eke out reduced income and unfortunate losses. Every teacher, however, has the opportunity for spending the vacation period in such a way that he can return to his work in September with renewed hopes and energy. After all, that is the purpose of a vacation and with this in mind INDUSTRIAL ARTS AND VOCATIONAL EDUCATION extends its best wishes to its readers, hoping that the 1933 vacation will be as worth while and as beneficial as any that has gone before.

THIS MONTH'S COVER

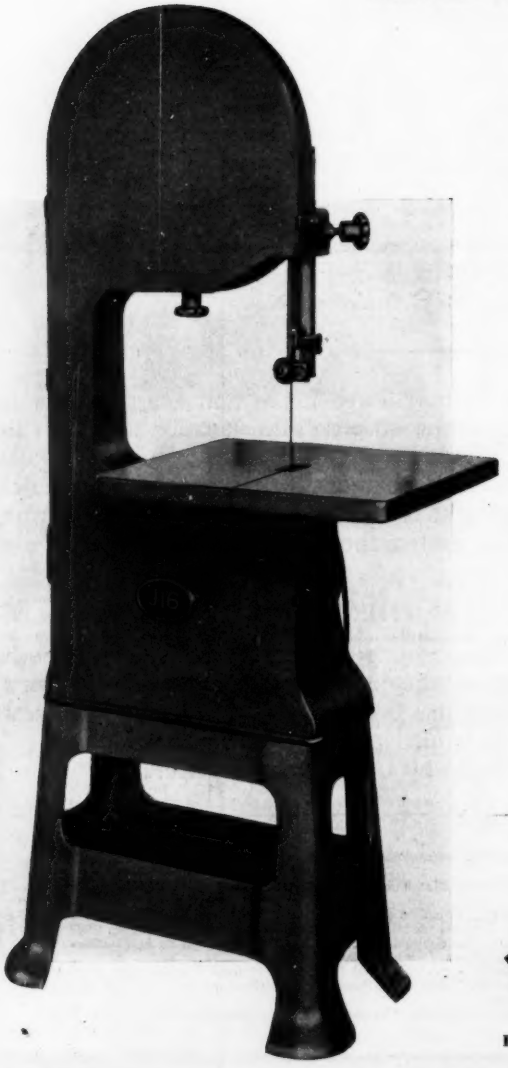
The cover picture this month shows another step in the process of lumbering. The spruce shown has been bucked into logs and is ready to be hauled away for transportation.

Photo by U. S. Forest Service.

Articles Indexed—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."
Entered Jan. 2, 1914, as second-class mail matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1932, by Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, Nov. 25, 1930.
Subscription Information—Subscription price, $2.50 per year, payable in advance. Canadian postage and tariff, $1.00, foreign countries, 50 cents. Copies not over three months old, 25 cents; more than three months, 50 cents. Notices for discontinuance of subscription must reach Publication Office in Milwaukee, at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.
Editorial Contributions.—The Editors invite contributions bearing upon Industrial Arts, Vocational Education, Manual Training, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.
The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Philippine Education Co., Manila, P. I.

A chip of the old block . . .

Another member of the new Yates - American line of school machines



The J-16 Scroll Band Saw is a small reproduction of the famous Y-30 and Y-36 Band Saws. Like the larger machines it has disc wheels running in selected ball bearings, motor mounted on lower wheel shaft, full cover for the wheels and the saw blade, and a sensitive straining device. It is sturdy enough for the severe work of an industrial plant yet small in size and capacity to suit it to the requirements of manual training and vocational school shops . . . and the price places it within reach of all schools.

It will be to your interest to get acquainted with this new line of small machines designed especially for school shop work and instruction. Circulars and full particulars gladly sent upon request.

YATES-AMERICAN

YATES-AMERICAN MACHINE COMPANY

Rochester, N. Y. BELOIT, WISCONSIN, U. S. A. Hamilton, Canada

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

July, 1933
Vol. 22, No. 7

Industrial Education and Change

Clyde A. Bowman

Dean, School of Industrial Education,
The Stout Institute, Menomonie, Wisconsin

A well-planned method which will assist the progressive educator in the fields of industrial arts and vocational education to keep abreast of the changes which present-day conditions make necessary.

THE present topsy-turvy conditions are causing many people in many occupations to stop, look, and listen. They wonder what is going next as well as what is coming next. The industrial educators are no exception to the rule. Finances, class sizes, enrollment distributions, departmental assignments, and other things too numerous to mention are prominent in the individual's professional stage setting. We hear much of redistribution. We are keenly interested in finding out just what is to be distributed. What work is to be redistributed? What content is to be redistributed? What people are to be redistributed?

Elmo Calkins wrote an article in the *Atlantic Monthly* in 1927 entitled, "Business Has Wings" which was read by many thousands of people. Many are wondering now where the wings took it. Also, "What is flying next and where to?" Of late years, especially prior to 1929, we heard much about the "tempo" of American business, of American civilization, etc. Change is identified by numerous writers as the biggest competitor of any business and of any worker in any occupation.

What is in industrial education? Is change the biggest competitor of the industrial educator? Is there change in education as much as in other occupations? What are the factors in education to look at to see if they are changing? Where is the educator in the picture? What is he? To know his business what should he know? To be an efficient industrial teacher what should he do? These are samples of the questions which are coming at the writer as a steady diet. Teachers on the job, teachers out of the job, young teachers preparing for the job, school executives and various classifications of "others" produce these questions and similar ones.

These questions indicate with increasing volume and with increasing clearness that the teacher is coming more and more into the limelight. As our occupational, civic, and recreational environments move to perplexing and complex new forms the school is called upon to interpret the new situations. It is the teacher who must prepare the young people to meet and solve the problems of their several environments. Further, the teacher is called upon to guide and prepare adults in their endeavors to keep pace with change. The definition of the range of the responsibility of the modern teacher is based on an interpretation of school age as that period in the life of an individual beginning shortly after birth and continuing until death. Perhaps this length of the period may be slightly shorter at the present. Modern trends seem to leave little of one's life out of the schoolage period, however.

In his constant work in this social service, the individual teacher must not lose sight of the change in the intimate inner details of his own occupation. In addition to continuous identification and interpretation of change for the purpose of keeping educational opportunity up to date for others, he must keep himself professionally up to date. He must have a tangible inventory of the things which he must possess, the things he must do, and the techniques which he must acquire and use. He must keep these constantly abreast of the times. Teacher training and the improvement of teachers in service must serve the teachers directly in this. It must prepare the young teacher in training to adequately meet the requirements of the profession when he enters. It must offer continuous opportunity for the teacher at work to professionally inventory himself, to identify the changes in professional requirements, and to meet them.

Studying the questions cited above; working in curriculum construction, operation, and revision to serve the teachers in training and the teachers in service; and watching educational change, the writer has been experimenting for several years with the construction of a professional inventory graph. This Teacher Analysis Checking Sheet will serve the industrial teacher in a number of ways. In fact, in a rather wide range of trial it has been just as useful with other teachers as with industrial teachers. In view of the fact, however, that

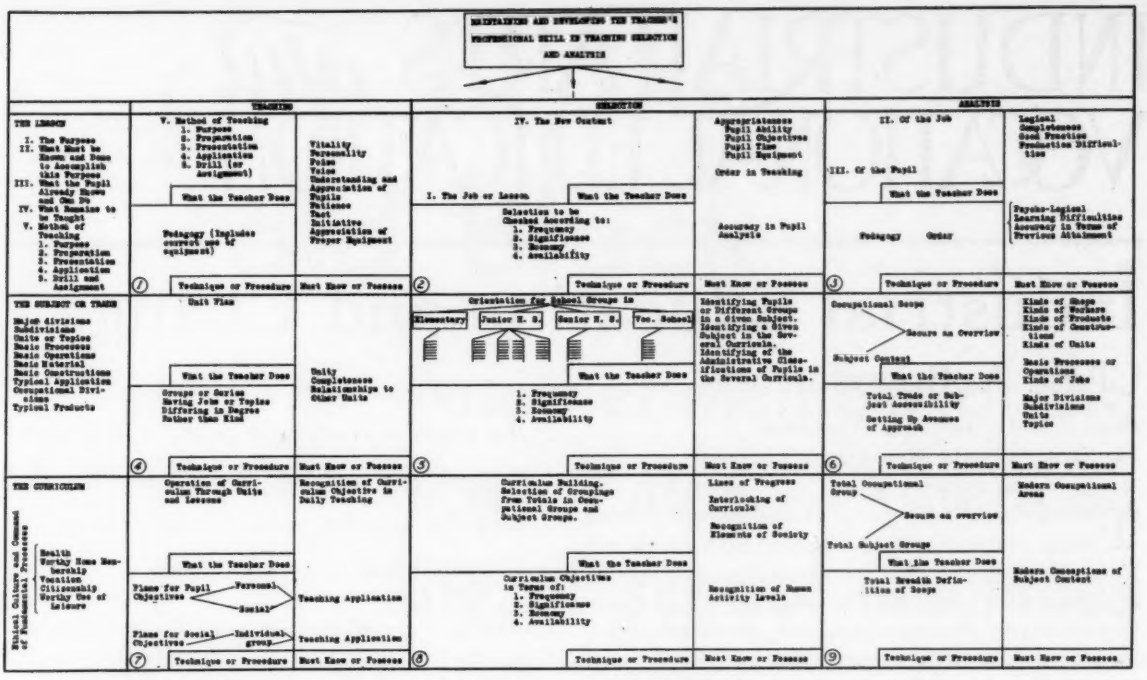


Fig. 1. Teacher analysis checking sheet

the work was carried on in connection with industrial teaching, the illustrations are largely confined to that field. Some of the uses of the Teacher Analysis Checking Sheet are as follows:

1. It enables the industrial teacher to clearly identify the possessions which he should have professionally.

2. It enables him to inventory the activities which he should engage in, in order to fully meet his responsibilities as a teacher.

3. It enables him to recognize the techniques which he should use in his work as a teacher.

4. It enables him to present himself well professionally to school executives, parents, school patrons, employers, students, and others.

Figure 1 indicates the mechanical form of the graph which has seemed to present the most possibilities of those tried. It is possible that it has been condensed too much. In the descriptive material to follow, effort will be made to indicate the significance of terms used in the graph. The graph has been used to orient and integrate subjects in training programs for teachers in training. Assignments, individual performances, investigations, field trips, observation and practice-teaching experiences, coöperative shop and other industrial experiences, and the like, have been linked together in a related total. It has been used as a professional self-analysis inventory by teachers in service. In this latter use it has served as a very helpful aid in locating the selections of further study in the building up of professional qualifications.

The reader will be helped in his consideration of the descriptive material relative to terms and relationships used in the graph if a sample of the "trouble shooting"

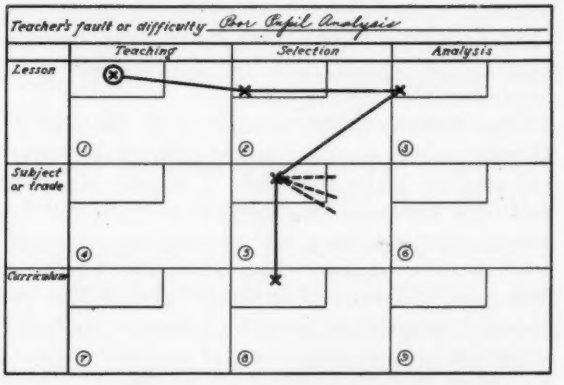


Fig. 2. Showing how the teacher analysis checking sheet may be used for "trouble shooting"

use of the graph is suggested here. Figure 2 is a sample skeleton Teacher Analysis Checking Sheet such as is used for this purpose. In the modern teaching situations in which the industrial teacher works, some of the professional difficulties which are found are as follows:

Poor pupil analysis.

Poor distribution of emphasis.

Teaches subject rather than pupils.

Loose unit arrangements. Lessons not well grouped. Lessons not in good sequence. Groupings of content for instruction not identified.

Lack of coöperative participation in guidance responsibilities in pupil programming.

Lack of instructional analysis of subject or occupation to be taught.

Restricted interpretation of the curriculum.

Unacquainted with new curriculum offerings.

Not acquainted with the total scope of the field of content represented. Narrow in conception of the subject or occupational group represented.

Pupils not identified in terms of purpose, ability, and progress.

Pupils not allowed to participate in selection and definition of activities.

Regards subject-matter acquisition as an end rather than a means.

Figure 2 is a probable diagnosis line where a teacher is having trouble with his teaching in a certain class because he has assumed that the students can do things which they cannot do, or because he thinks they know things which they do not know. The particular trouble observed while the teacher is teaching would be given its initial diagnostic location in "preparation" in method of teaching. In conducting an investigation with the teacher to find out the cause of his trouble to prevent it when his class returns, the line of investigation would go to Area 2 next. In this particular case the difficulty is assumed to be so extreme that the *selection of the job or lesson* is immediately challenged. With this question in mind, the *analysis* of the *pupil* is studied. If the situation is serious, further investigation of the teacher's *orienting of his pupils* in the subject becomes necessary. This investigation of his orientation of his students may well include a check-up to determine his knowledge as indicated by the dotted lines in Area 5. If investigation here indicates further shortage, the study should be continued to Area 8 and include opportunity for the teacher to become acquainted with the curriculum avenues of educational travel available in the school and school system in which he is working as a teacher. This line of diagnosis represents a situation which would be a rather serious one and in which a very considerable amount of teacher-improvement-in-service work must be done. The location of his studies to correct this difficulty would be back along the line indicated in the diagnosis.

Following the descriptive material which shows the significance of content in the nine areas and also the relationships existing between the areas, a series of sample difficulties with diagnosis plotted in the graphs will be shown. (See Figs. 9 to 17.) In these graphs the difficulties will be identified in terms of the probable initial location, their probable origins will be traced out, and suggestive plans for corrective studies indicated.

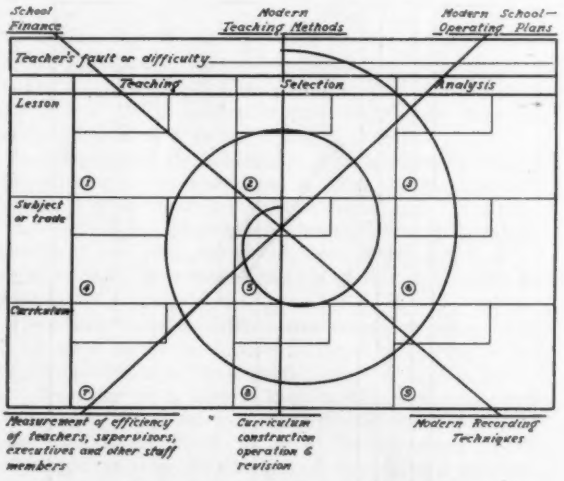
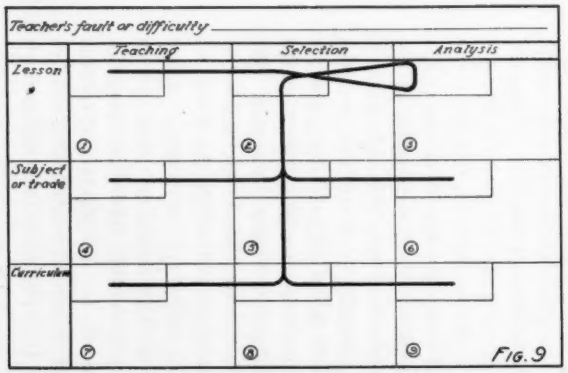
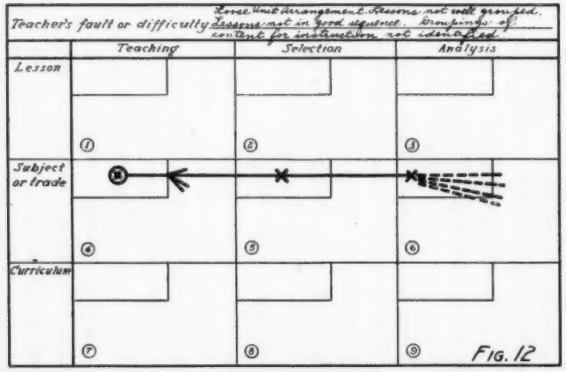


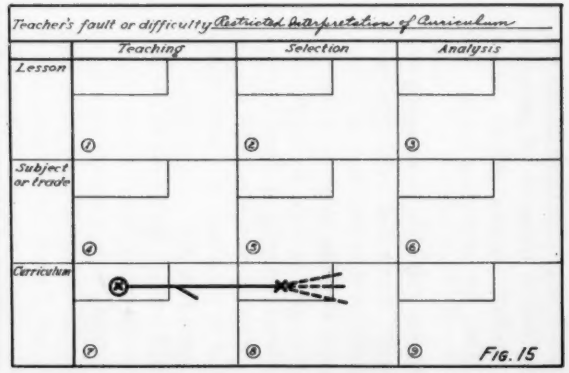
Fig. 3. Lines of professional growth which industrial educators must maintain if they want to keep abreast of advances in their field

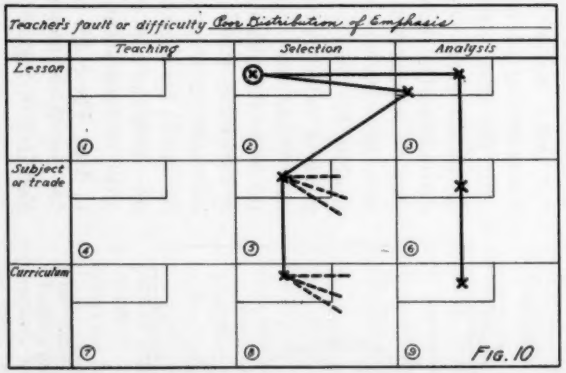
Figure 3 is referred to at this time to recognize the lines of professional study which industrial educators should maintain in order that they may keep pace with advances in their occupation. The skeleton reproduction of the checking sheet may be regarded as the core of the teacher's professional situation. Before developing this point, the fact must be recognized that in carrying on the work as it is presented in the teacher's responsibility, studies must be made along the lines indicated in the spokes in Figure 3. Beginning at the upper right, modern school-operating plans are constantly being improved. The teacher should maintain an intimate acquaintance with the details in these plans and the basis on which they are worked out. He must know his place in them and his relationships with other members in the plan. Continuing across to the left, he must naturally keep his teaching methods in harmony with modern developments of good teaching technique. The modern studies in costs and space distribution, as well as the economic situation which is very much in evidence at the present time, bring school finance very much into the picture. The industrial educator should be able to interpret the details in budget planning. He should be familiar with cost distributions and the methods of determining costs. He should be constantly on the alert to justify his portion of the budget.

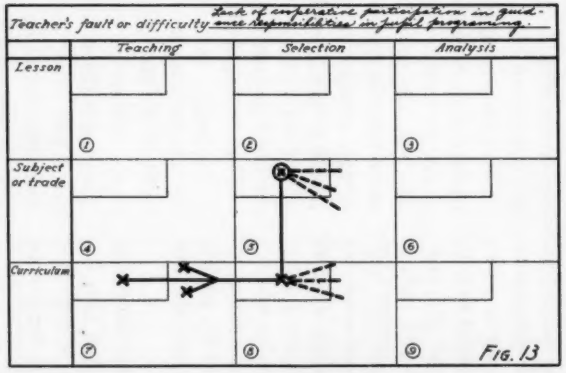
The developments being made in the measurement of the ability and achievement of pupils have begun to carry over into the rating plans used for the measurement of the efficiency of the teaching and supervisory staffs. Industrial teachers should be thoroughly acquainted with factors now included in efficiency rating plans and other measuring devices. Curriculum construction, operation, and revision is receiving more attention now than ever. The activities included in Areas 7, 8, and 9 deal with this phase of the teacher's work. The industrial teacher should be thoroughly acquainted with the best modern educational philosophy. He should know the place of the several subjects in the curriculum. He should know the contributions which they are expected to make in the development of the boys and girls who make their way through the curriculum. He must be especially well informed as to the place of industrial work in its various levels and its various purpose classifications in the curriculum. In the lower right-hand corner of Figure 3 one more line of continuous study and preparation for the teacher is indicated. In acquainting himself with the range of content in his total responsibility, the modern teacher soon feels the need of efficient recording techniques in order to keep accurate accessible records of progress to date. These are records for his pupils and records for him. With these six groups of contributing studies identified in Figure 3, it is probable that explanatory

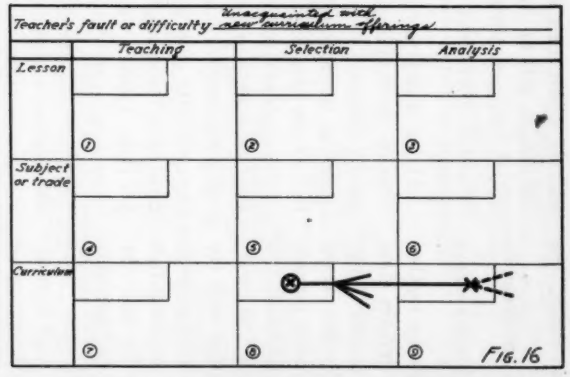


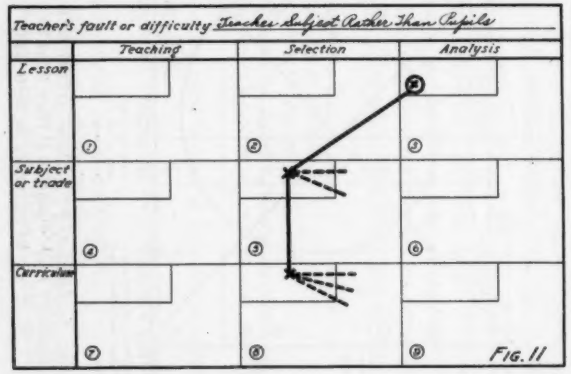

Teacher's fault or difficulty Loose unit arrangement. Lessons not well grouped. Lessons not in good sequence. Dumpings of content for instruction, not identified.
Teaching
Selection
Analysis
Lesson
Subject or trade
Curriculum
FIG. 12

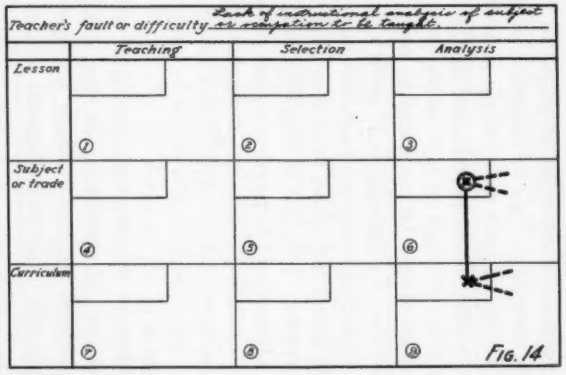


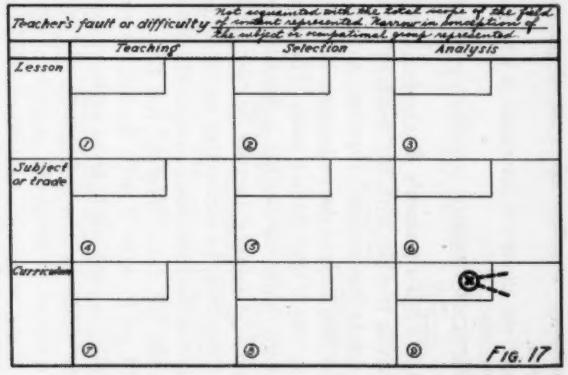











Teacher's fault or difficulty Not acquainted with the total scope of the field of content represented. Narrow conceptions of the subject in vocational group represented.
Teaching
Selection
Analysis
Lesson
Subject or trade
Curriculum
FIG. 17

Figs. 9 to 17 show how the graphs are used for sample diagnostic plotting. Fig. 9, for instance, shows how the social and pedagogical roots of the lesson (area 1) go to all of the other areas. In Fig. 10, the content may be too difficult (area 2). To find out, investigate along line to analysis (area 3 to 6 to 9) for content orientation and along line to analysis (area 3 to 5 to 8) for pupil orientation in terms of his purpose, ability, and progress. To correct the difficulty teach the teacher back along these lines

material relative to each of the nine areas will be most helpful as the next consideration.

The teacher finds himself between the formal educational structure of method and content which tradition has carried down to us on the one hand, and the flexible, changing-to-meet-modern-world-situations philosophy of the progressive school movement. We are rapidly recognizing that it is not so much what the individual knows that is significant — it is what he does with what he knows. Figure 4 suggests the relationships between the nine areas. These form the orderly plan in which the teacher can orient the new factors in the problems brought about by change.

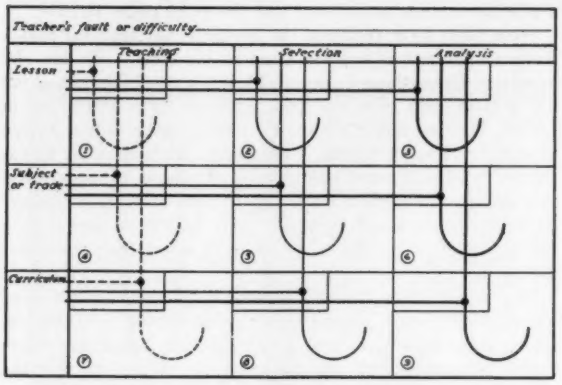


Fig. 4. Diagram showing the relationship existing between the nine areas on the teaching analysis checking sheet

Figure 4 identifies in skeleton form the basic relationship that exists between the three parts in each area. The identification of the activity in each area, that is, *that which the teacher does*, is in each case through a combination of some one of the three phases identified across the top, and some one of the three levels identified at the left. The teacher in his work is not only concerned with simply teaching pupils. He also must participate in the work of the *selection* of jobs or lessons or work assignments for the students, as well as the selection of the new material in lessons after they have been selected. He also must participate in the *analysis* of the content in proposed lessons, jobs or work assignments, as well as participate in the analysis of pupils.

(Continued in the August issue)

Printing by General-Shop Methods

Crawford Park

South High School,
Youngstown, Ohio

By definite organization and by applying the general-shop method in his printing classes, the author has succeeded in extending the guidance possibilities of his work.

MODERN educators have developed the idea that education is primarily guidance. As yet, however, no method has been developed of successfully guiding a large group of students, as a group. The only practical method of instruction has been found to be the individual one. But how to carry out this plan has worried the majority of academic and trade teachers until many of them have given up the problem in despair and have held to the old "recitation" method. Along with this lack of organization, the method of grading a student's work also is archaic. The student is at no time sure of the amount of progress made in his individual case — not even sure that he is making progress.

In order to give real guidance to each individual student in his particular job or lesson, and in order that he may know that his progress is either rapid or slow, a system of instruction based on the general-shop idea and embodying definite methods of recording progress has been devised and is in use in the printing department at South High School, Youngstown, Ohio.

The scheme uses, primarily, a shop manual covering the essential steps in the production of the printing matter that might be produced by the average class. This book is divided into the major units, such as copy writing, designing, typesetting, etc. The entire manual is divided up into definite steps, each small enough to be easily understood by the student and centering the attention of the pupil on a particular point in a given job. Each step enables the teacher to concentrate his criticism on a definite limited area.

One of the major steps in the manual is an O.K. step which instructs the student to come to the teacher for approval of his work at various intervals in the progress of the job. This step prevents the student from continuing with the job incorrectly, as he may not proceed until the teacher marks his approval on the work done. No one can doubt that this is an emphatic advantage, because it does not allow the student to get too far from the teacher's guidance no matter how large the class or how busy the teacher may be. It is better not to learn a habit than to spend hours trying to "unlearn" it.

In a classroom where equipment is meager, each succeeding class must take up the work of the preceding class, using the same equipment and working on the same jobs. The question naturally arises: How is the work of these classes to be so coördinated that each may take up the work of the other without undue confusion and delay? This is, however, easily accomplished by a step-by-step check-off of the steps outlined in the manual. The students of the following classes know immediately, from this check-off, the point at which the boy in the preceding class stopped his work, and may then continue the work begun by the other student. No teacher can doubt that in our short-length periods of work such a scheme is an absolute essential to good instruction. No teacher can afford to spend the entire period in assigning work if he intends to give any instruction whatsoever.

In addition to a superior guidance and a more rhythmical working scheme, each student can determine his progress, not only from the criticisms of the teacher but also from the total of the step numbers torn out opposite each step he has com-

pleted in the manual and pasted into his record. The total number of step numbers in this record indicates the amount of work completed satisfactorily.

The general-shop plan will, furthermore, give the student a chance to classify the processes in the trade he studies. Instead of printing being one grand plaything, with no purpose, it becomes a well-organized structure which the commercial world uses to produce fine printing. Instead of just being a typesetter — as so many students of printing are — he may learn to be a designer, a copy writer, a stereotyper, or a worker in another branch of the great trade of printing. In other words, he has modernized his idea of the industrial world and is on his way to cope with the world as it is.

But, greatest of all the advantages of the general shop is the manner in which it enables the teacher to guide the student as to his natural abilities. Just as there are different kinds of apples, or horses, or mountains, or anything else, just so, there are different kinds of boys as to their abilities. These abilities find expression in the school shop, and if the school shop is designed on the general-shop plan it will enable each student to find his place in the class where his aptitudes are most needed. The teacher can, with very little difficulty then, note the success or failure of the boy and can talk with him, advising him as to the trade, profession, commercial or artistic line, which he should prepare for as a lifework.

The bigger industries of our country have shown us that more progress can be made where men are organized according to their executive, sales, trade, or artistic ability, than can be made where one man tries to do all the phases of the business. The twentieth century has shown the need for specialization better than any other period in history. Thus, if a boy is going to be a success in this world of specialization and keen competition, he must not only be trained but he must also be guided to use the ability he has — not some theoretic ability which the teacher or someone else thinks he ought to have.

Some folks have confused the problem, not realizing that a student's interest is not the same as his ability. He may be interested in anything in the world, but have ability not along one certain field. For example: Suppose he is interested in radios. Then he might either sell radios, make radios, design or operate radios according to his sales, trade, artistic, or executive ability. Consequently, it is not hard to understand that no person needs to limit their field of interest to any particular field, though they may have greater success if they will limit their activities to that field in which their particular ability lies.

The value to the student of such a thorough diagnosis of his abilities, in the general shop, supplemented by advice as to his development, is such an outstanding advantage financially, physically, and educationally, that it seems that the general shop is the best method of giving work which has real guidance value.

Kinks for the Shop Teacher

William L. Hunter

Industrial Arts Department,
Iowa State College, Ames, Iowa

A collection of interesting devices that will be found exceedingly helpful for shop teachers in general.

THE shop teacher is ever on the lookout for easier, quicker, and less expensive ways to do his work. The following ideas have served the writer in good stead many times and it is hoped that other industrial-arts teachers will find one or more of the suggestions useful.

Figure 1 shows an inexpensive emery-wheel dresser made of ⅛ by ¾-in. band iron, a few washers, and a bolt. The bolt should be just large enough to fit the washers and permit them to turn easily. The threaded portion of the bolt is cut off. The bolt is then drilled and cotter-keyed.

In Figure 2 is shown a ball-bearing triangle. Five ball bearings are secured about 1/32 to 1/16 in. larger in diameter than the thickness of the triangle. Five holes a few thousandths less in diameter than the balls are then drilled in the triangle. The balls are pressed into the holes so as to project equally on each side. The advantages of this triangle are that it does not smear pencil lines, blurs fewer ink lines, and is easier to pick up. The other holes shown in the triangle are used to make guide lines.

A "duo-economy" soldering-iron heater is illustrated in Figure 3. This is made of a few short lengths of pipe of appropriate diameter for the soldering coppers, a tee, and a flange. The length of the upright piece of pipe should be such as to accommodate a blowtorch. A 1-in. hole is drilled in the tee so that the heat will reach both soldering coppers. Since the heat is inclosed, two irons can be heated with less than half the fuel ordinarily used to heat one.

Figure 4 shows a planing dolly or "hired man" which is almost indispensable to the bench woodworker once he has used it. The dolly is made the height of a bench and is used to assist in planing wide or long boards which cannot conveniently be planed on the bench top or in the vise.

The teacher who has often longed for a quick, easy way to make perspective drawings will find the three-way perspective board illustrated in Figure 5 very useful. The vanishing points determine the centers of the arcs to which the ends of the board are cut. These vanishing points must be the same distance from the lower edge of the board. However, one point may be farther away than the other. Vertical lines are drawn with the T square from the lower edge of the perspective board. The ends of the head of the T square are rounded slightly to fit the arcs.

In Figure 6 are illustrated two wire splicers. The one marked B is made from half of an ordinary strap hinge, and the other, A, from a piece of 3/16 by ¾-in. band iron. The splicers illustrated were made with the devices shown.

The nail-cutting tin snips, Figure 7, were made by grinding a small notch (see arrow in illustration) in the throat of the snips. This may be done with a thin wheel. As most shop teachers know, boys will be boys and one of the things which seems to be a part of boy nature is to want to cut nails with tin snips much to the damage of the cutting edge. However, if the notches are cut as shown and the boys are told of them, less damage will result.

The sandpaper pencil-sharpening pad shown in Figure 8 has been improved by gluing a small piece of felt to the handle. The felt is used to wipe the pencil on after sharpening, thus keeping the dust from getting on the drawing.

The utility soldering cup shown in Figure 9 is made from a 1-in. pipe cap and a piece of ⅛ by ½-in. band iron. The pipe cap is hinged so that it can be heated with a blowtorch or set on the bench and remain in a horizontal position. The soldering cup is very useful in electrical construction work.

Several uses for the device are shown in the illustration. Figure 10 shows the use to which ordinary wire solder may be put in the drawing of irregular curves.

A method of truing oilstones (not illustrated) which really works is that of using carborundum grit, any size from No. 36 to No. 80, on a steel or sheet-iron surface. The oilstones are rubbed on this grit. The ordinary stone hollowed by a year of shop use can be trued down in from three to five minutes by this method. The stones can then be boiled in sal soda and water to remove old, dried oil.

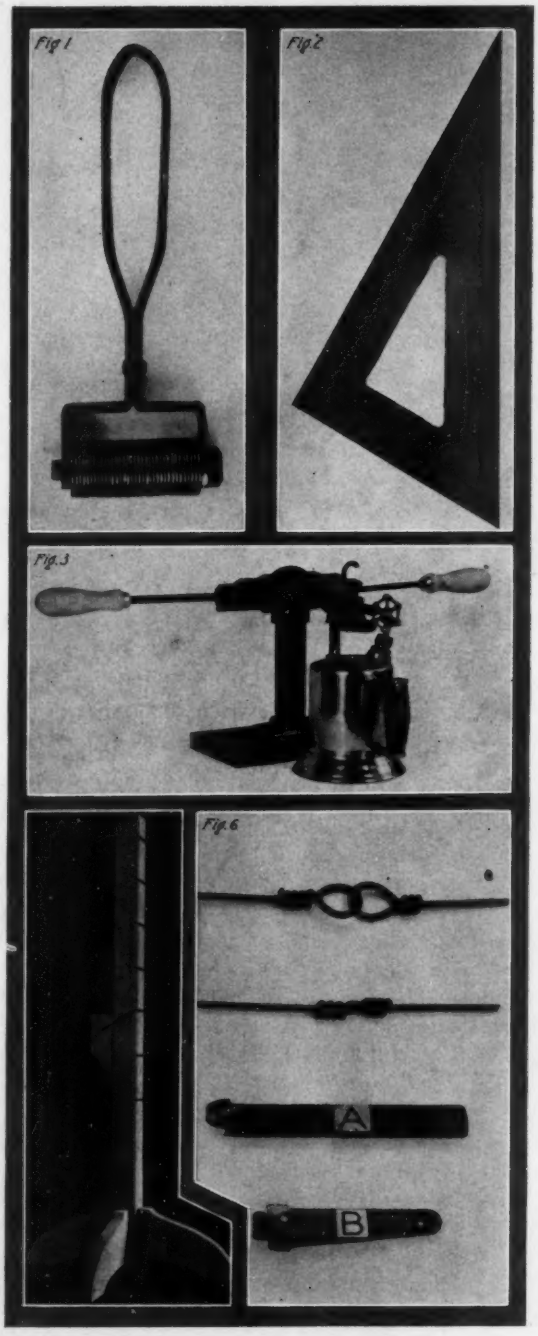


Fig. 1. Emery wheel dresser. Fig 2. Ball-bearing triangle. Fig. 3. Economy soldering-iron heater. Fig. 4. Planing dolly or hired man. Fig. 5. Three-way perspective board.

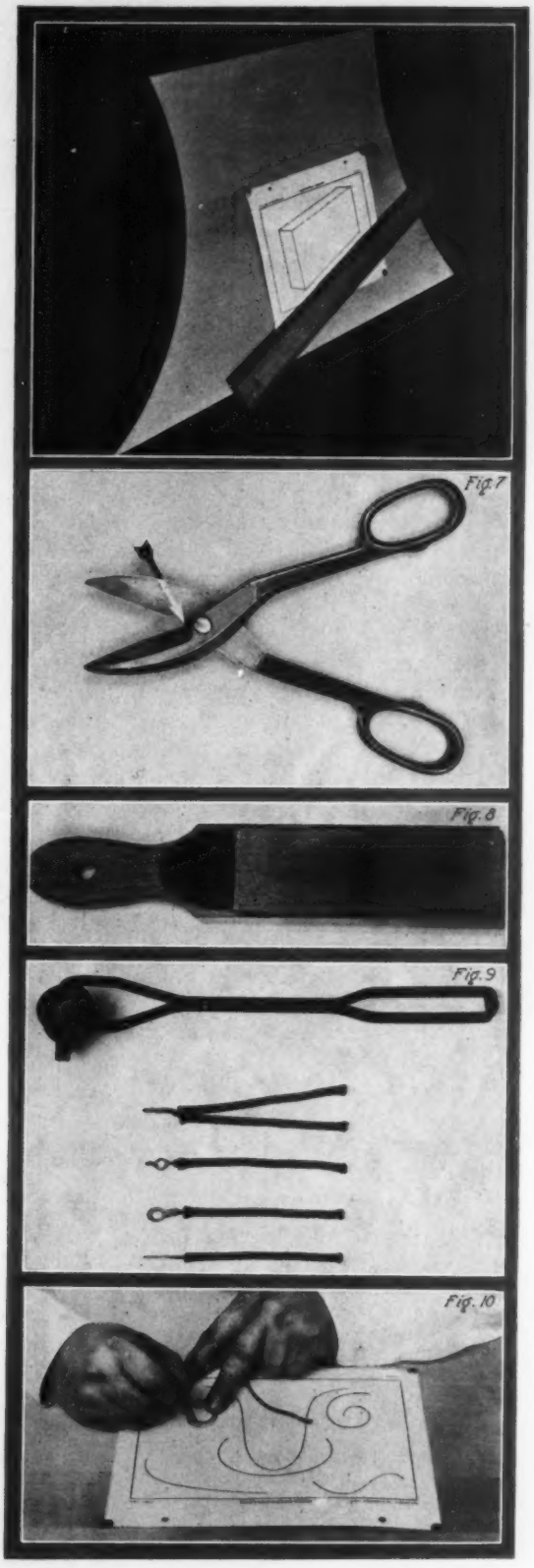


Fig. 6. Wire splicer. Fig. 7. Nail-cutting tin snips. Fig. 8. Felted sandpaper pad. Fig. 9. Utility soldering cup for electrical work. Fig. 10. Using wire solder for drawing irregular curves

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

The Shop Teacher and Drawing

Judging from appearances, it seems that many shop teachers do not feel that the making of drawings is a part of their work. This remark is based on the writer's experience with teacher-made working drawings which come from all parts of the United States and Canada.

Of course, many of the teachers here referred to have not specialized in drawing, nor do they teach drawing, and yet they must make working drawings for the use of the students in the school shop. No doubt these teachers are quite insistent that the work turned out by their students is kept up to a high standard, yet they themselves, as their drawings attest, are satisfied to present to their students working drawings which would not be accepted by the craftsmen in the industrial field. Not only is the lettering so poor on some of these drawings that it detracts from the drawing itself, but frequently the views are not properly placed, or the information given is not specific enough to answer the questions that the workman might legitimately ask. Occasionally even first-angle and third-angle projections are found on the same drawing, and not infrequently some of the dimensions are illegible. If a skilled artisan were asked to work from some of these drawings, he could not succeed — how then can a beginner be expected to do anything with them?

Mechanical drawing in one form or another, is one of the tools of the shop teacher's profession. If there is anything to the old saying that the workman is known by his tools, a great many shop teachers may well look to the further development of their knowledge of and skill in mechanical drawing if they do not want to be adversely criticized. Their professional position demands it.

The shop teachers to whom this editorial applies can do no better than to spend a few hours each day during the coming vacation at their drafting boards. Short as the time may seem, it will do much to improve their knowledge and technique in a branch of their work which does much to reflect on their professional standing.

The Wrong Method of Teaching

Newspapers and magazines at times make the serious error of explaining and illustrating the criminal methods of the antisocial elements of our country so explicitly that not infrequently a very epidemic of crime can be traced to the publication of a certain article or series of articles. It is hard to explain why reputable publications should waste time, effort, and editorial space on such pernicious practices. Probably some editors feel that they should satisfy all of their readers, and therefore feel that they are doing no wrong by giving that portion of their readers who are morbidly curious an opportunity to revel in the minute details of criminal procedure. Evidently, while they are printing this type of material, they are not taking into account that there are some readers who are mentally so maladjusted that they almost automatically follow the suggestions contained in this type of exceedingly dangerous literature. These publishers evidently do not take into account that they are furnishing first-class textbooks for criminals and for those criminally minded, and that they are assuming an enormous responsibility in so doing.

Teachers, too, can learn a valuable lesson from the detrimental results which follow these wrong methods of teaching. The shop teacher, for instance, must bear in mind that he can overemphasize in his demonstrations the points that he does not want his students to do. It may be and often is necessary to demonstrate the wrong method as well as the right so that the teacher may be sure that the student learns what he must avoid. Nevertheless, in all of these demonstrations, the teacher should be sure to place the main emphasis on the correct method of doing in order that this may make the strongest impression on the student's mind.

In teaching safety, this is especially important. Wherever possible, the positive method of teaching should be adopted. A strong mental picture of what is expected of the student is much better than a vivid impression of what he should not do, especially if that vivid impression is accompanied by only a vague image of how he is to react under certain circumstances.

A little reflection will show the importance of placing the emphasis where it is most needed, and how easy it is to inadvertently put it in the wrong place.

A Question of Economy

In these days in which the increased demands of the school shop must be met by a very much decreased budget, there is a temptation for the shop teacher to take care of his new requirements and his replacements for old equipment and tools by buying cheaper grades. Buying replacements at present is economy in itself because prices of most of the standard goods are down to rock bottom. The purchaser, however, should beware of sacrificing quality for price. There are all kinds and degrees of bootleg products on the market at present. Many of them, like the proverbial wooden nutmeg, were made primarily to sell.

Probably there is no place where tools and equipment receive harder usage than in the school shop, and the person who has the responsibility of buying materials for the school shop should bear this in mind. Economy should dictate that a serious study be made of what is most needed, but under no conditions must quality be sacrificed by purchasing with a blind dependence on price alone.

Content of the Drafting Course

William P. Hale

Collinsville Township High School,
Collinsville, Illinois

A method of choosing what to teach in mechanical drawing by scrutinizing the types of drawings most frequently seen by the reader of newspapers, magazines, and books.

IN ORDER to emphasize the most necessary subject material in a high-school drafting course, the study herewith presented was made so as to discover what types of drawings appear before the public with the greatest frequency.

The sources of data chosen were newspapers, library books, magazines, and mailed advertisements or handbills. A ten-day period of consecutive issues of eleven different newspapers, namely, the Ames (Iowa) Daily Tribune Times, Chicago Tribune, Decatur (Illinois) Review, Des Moines Register, Kansas City Star, Nebraska State Journal, New York Times, St. Louis Star, United States Daily, were scanned for drawings that originated in the drafting room or in the office of some commercial artist. The number of each kind of drawing and the areas of each were recorded. The results of the frequency of occurrence are shown in Figure 1.

A similar process was used on every tenth book on the shelves of the library in the school where the writer teaches. In this way, 158 books were scanned. The frequency results are shown in Figure 2.

Six consecutive issues of ten different magazines representing the various walks of life were used. The magazines chosen were the American, Business Week, House and Garden,

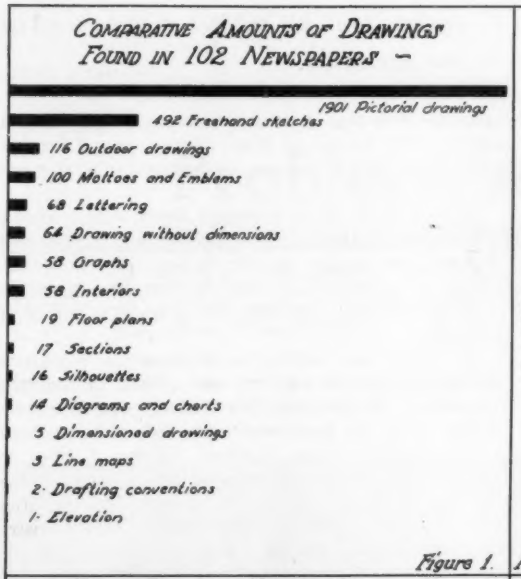


Figure 1.

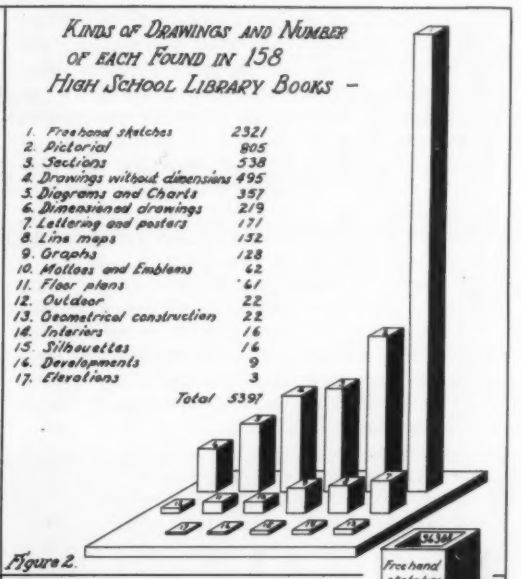

Kinds of Drawings and Number of Each Found in 158 High School Library Books –
1. Freehand sketches 2321
2. Pictorial 805
3. Sections 538
4. Drawings without dimensions 495
5. Diagrams and Charts 357
6. Dimensioned drawings 219
7. Lettering and posters 171
8. Line maps 132
9. Graphs 128
10. Mottoes and Emblems 62
11. Floor plans 61
12. Outdoor 22
13. Geometrical construction 22
14. Interiors 16
15. Silhouettes 16
16. Developments 9
17. Elevations 3
Total 5397

Figure 2.

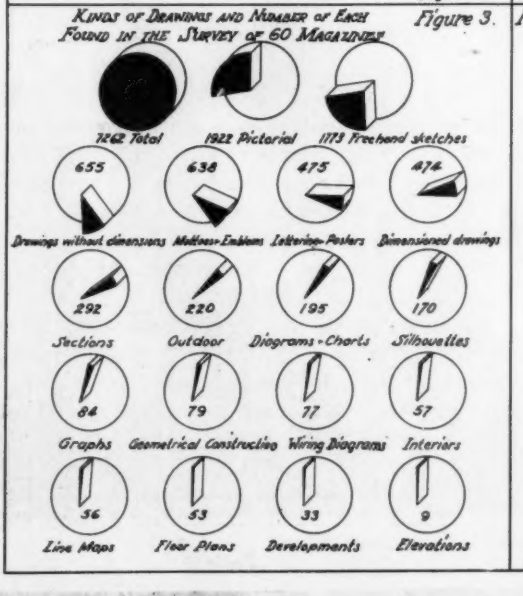


Figure 3.

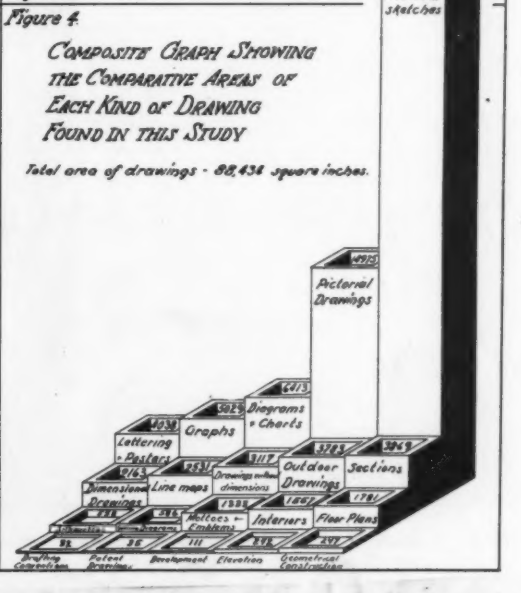


Figure 4.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Journal of the National Education Association, Literary Digest, National Farm Journal, Popular Mechanics, Saturday Evening Post, and Scientific American. The frequency results are shown in Figure 3.

Similar treatment was given to all the handbills and advertisements that the writer received in the course of one school year. These results are not shown in a graph but are included in the composite area graph for the complete study shown in Figure 4.

In all the sources studied, there were 15,794 drawings covering an area of 88,434 sq. in.

It is interesting to note that this study shows a race between free-hand sketches and pictorial drawings, both of which probably receive a small amount of attention in the average mechanical-drawing course. Pictorial drawings, with a frequency of 4,662, won by a close margin over the 4,602 free-hand sketches found in the literature that was scrutinized. The other types of drawing hold about the same places in the frequency race as in that of area, as is shown in Figure 4.

It seems to the writer that there are several types of drawings represented in the accompanying graphs that could well be placed in a course in mechanical drawing, especially in those schools that have no art department.

The Industrial-Arts Curriculum

W. C. Wilson

Teachers College,
Johnson City, Tennessee

The stigma of a special subject will be removed from industrial arts only when every industrial-arts teacher fully recognizes that his subject is a part of general education.

WHILE a committee of the industrial-arts department of the State Teachers' Association of Tennessee, and a similar committee from the East Tennessee Teachers' Association were working on an industrial-arts curriculum for the state, it was thought necessary to find a common ground with the curriculum builders of the other subjects that make up general education. To this end the seven objectives that were adopted by the National Education Association, viz., (1) health, (2) fundamentals, (3) worthy home membership, (4) citizenship, (5) vocational efficiency, (6) worthy use of leisure, and (7) ethical character, were taken as a basis.

With the acceptance of these general objectives, it became necessary to define the subject and set up its objectives. The definition agreed upon was: Industrial arts is that phase of general education which deals with the manipulation of tools and materials, and the related knowledge pertaining thereto, as a means of acquainting the pupil with his material environment and in aiding him in its conquest.

It will be noted that this definition excludes the vocational and the prevocational entirely, and places the emphasis upon general education through knowledge about and ability to use or work with the things with which the student comes in contact. It is true, however, that any subject taught by a highly skilled teacher of broad intelligence will have prevocational value in a high degree to the pupil who later on adopts it as a vocation.

Table I shows the relationships which were worked out between the objectives of industrial-arts and general education. Setting them up side by side so that the functioning possibilities of industrial arts may be seen more readily, affords a realization that industrial arts is really a part of general education.

An inquiry was next made to show the evaluation of a limited number of subjects now offered in industrial arts throughout the country. This disclosed the results shown in Table II. In the first column are listed the twelve leading industrial-arts subjects reported. Column 2 gives the frequency of the subject as reported by 57 junior high schools in cities of 75,000 and above. Column 3 gives the rank of these subjects according to the number of schools in which they are taught. Columns 4 and 5 give similar data in cities less than 75,000. Columns 6 and 7 give results in 119 four-year high schools. It will be noted that the frequency rank

Table 1. A comparison of the objectives in industrial arts and general education

Subject	Junior High School				4-Year High School		Teachers		
	No. in 57 Schools	Rank	No. in 75 Schools	Rank	No. in 119 Schools	Rank	Numerical Rating by 18 Experts	Rank	Composite Rank
Woodwork	29	1	41	1	119	1	22.1	1	1
Mechanical Drawing	28	2	38	2	101	2	20.	2	2
Sheet Metal	26	3	34	3	92	3	13.9	8	3
Printing	24	4	25	4	84	4	14.7	7	4
Home Mechanics	21	5	23	5	67	5	16.8	5	5
Electric Shop	20	6	22	6	66	6	18.	4	6
Carpentry	16	8	18	8	49	8	19.7	3	7
Forging	19	7	20	7	63	7	10.3	11	8
Machine Shop	12	9	16	9	47	9	14.8	6	9
Plumbing	4	10	6	10	16	10	11.7	9	10
Turning	2	11	4	11	6	11			11
Auto Mechanics							10.	10	
Column 1	2	3	4	5	6	7	8	9	10

Table 2

of these three groups is identical. This table, therefore, may be said to show current practice.

To secure expert opinion as to the relative merits of these subjects, 16 determining factors were agreed upon. These factors are listed in Table III. Then to give numerical value to their ratings, an arbitrary base was set up for woodwork with which the other subjects might be compared and rated.

The figures to the left in the following table are the base values given to woodwork.

Table III

Determining factors in industrial-arts subjects:

100 The universality of the material.
100 The degree to which fundamental tools are used.
100 The number and variety of tools used.
100 The degree of skill required.

The extent of the use of the material and its products:

100 In the community.
100 In the home.
100 On the farm.
80 The magnitude of the industry in the country.
100 Its probable future.

Its richness:

50 In historic lore.
100 In scientific content.
50 In related subject matter.
100 In art possibilities.
100 In good-habits possibilities.
100 Its value as a tryout course in vocational guidance.

This method of evaluation may appear unscientific and crude, yet it seems the only one that could be used to obtain a composite ranking with those obtained from the current practice in school groups.

Column 8, Table II, gives the average ratings in hundreds and column 9 gives the rank according to these ratings. Column 10 gives a composite ranking of columns 3, 5, 7, and 9. This places the first ten subjects listed in the table in the order given in Table I. It is not expected that all will approve the evaluation obtained for these ten subjects. Whether the continuance of subjects now being taught, or the selection of subjects to be added, would be affected by this study is not of major importance. It is vastly more important that the teachers of Tennessee should have pooled their thinking and reached some common conclusions.

It is worth while to set up specific objectives in order to give direction to effort. Aimless teaching is usually futile. It is equally worth while to know what subjects are being taught in other schools, but what is of more value is to so build a curriculum that every subject may be justified by showing that it fulfills definite objectives.

A study such as has been described, therefore, lays a very good foundation for: first, analyzing a given subject; second, breaking it up into instructional units; and third, arranging the component parts into a usable instructional sequence.

Problems and Projects

A USEFUL TRANSIT

H. D. Campbell and J. W. Strahl, J. Sterling Morton High School, Cicero, Illinois

(See Supplement No. 269)

Supplement No. 269 shows a transit designed and built in our shops and used by the mathematics department in teaching practical applications of trigonometry.

This piece of laboratory equipment has proved to be quite as useful for this purpose as a surveyor's instrument. It is more suitable for classroom use than the more expensive piece of apparatus because it has fewer parts which can get out of order.

The project illustrates our method of "instruction by production" of useful tools, machines, and equipment as con-

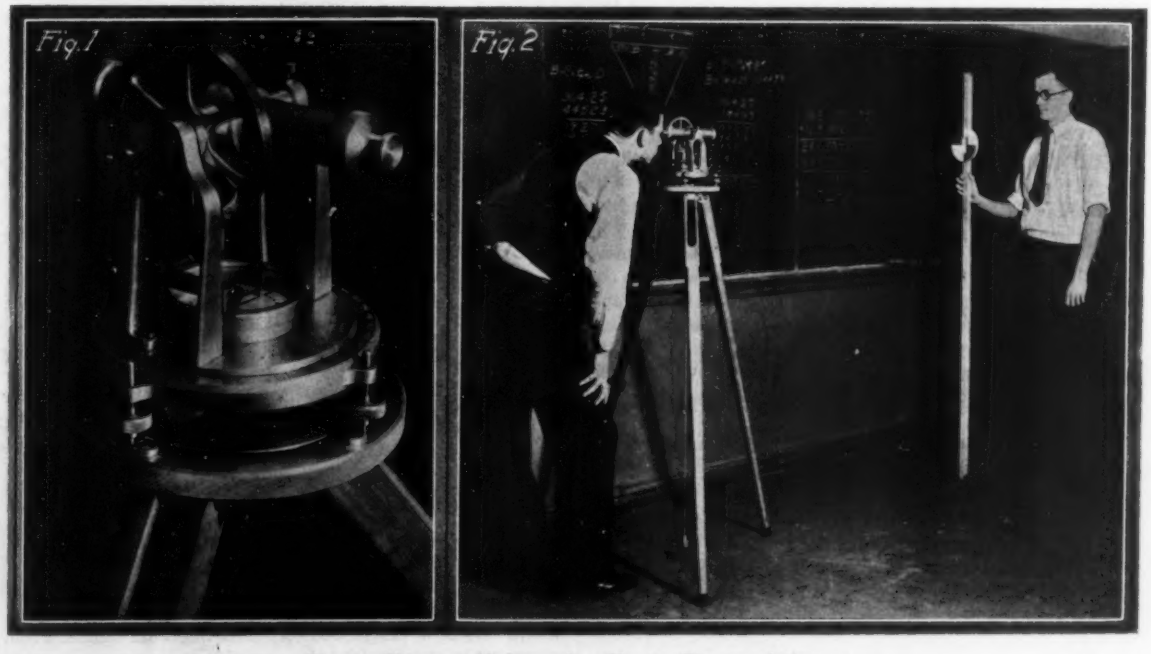


Fig. 1. The assembled transit. Fig. 2. The transit in use

trasted with the more general method of instruction by means of a series of drawing plates and shopwork problems in which each shop carries on independent of the rest. The transit is the result of the coöperative effort of six teachers and approximately fifty students in the drafting, patternmaking, general-metal (nonferrous foundry), machine, watch-repair, and woodworking shops.

The dimensioned assembly in supplement No. 269 is offered as a point of departure for the teacher who has his students detail the transit or, better still, redesign it. While the principal dimensions and the material list are given, much is left for the students to work out for themselves even if no redesign is attempted. For example, part No. 20 appears to be balanced on the top of part No. 5. Some thought and imagination will be required of the students who discover the preferred method of locking the telescope at any desired position in relation to the horizontal plane. We have discarded the method of locking shown in Figure 1.

The construction of a transit similar to the one illustrated has a number of advantages to the drafting division, to the various shops, and to the school as a whole.

The draftsmen must design rather than copy, and their drawings must be "working" drawings, which eventually will be checked by actual construction.

The patterns are small and quite simple.

The castings can be made from junk crankcases by means of a crucible and forge fire, or in a gas furnace, and a minimum of molding equipment is needed.

The machining and assembling, described later, does not require unusual equipment and presents an opportunity for the development of the finest workmanship.

Finally, shop students will be spared the expense of making some of the problems in the regular course while constructing a useful piece of equipment costing the school a small part of what would be paid for a secondhand surveyor's transit.

The following statements are made in answer to questions commonly asked about our transit:

1. There are no lenses. A peephole in the eyepiece and a disk of window glass to protect the cross wires take the place of the customary lenses. The limit of visibility varies with the sight of the user but no trouble will be experienced in laying out a football field or measuring the height of a smokestack.

2. Our compass needle was jeweled in the vocational watch-repair shop, but a simpler needle would work well enough.

3. *All parts* except the compass needle and pivot *must be nonmagnetic.*

Machining the Transit

The problem of machining the transit is not so difficult as may appear. It is necessary, however, for the mating parts to fit properly, and we have found that the following procedure gives the best results:

1. On one side of part No. 3 (the base plate) a large "boss" is cast. This is used for machining only, and is not shown in the assembly. Chuck the part by this boss, face one side, and turn to the proper outside diameter. With this same chucking, counterbore for the plate pivot part No. 4. Also bore a 5/16-in. hole through the center. This is later used for machining and assembling. This part may now be used as a gauge for boring part No. 1.

2. Next, chuck, face, and bore part No. 1, the base, to receive part No. 3 with a good sliding fit. In the center, drill and tap a 5/16-in. hole for clamping part No. 3 in position while facing the top and turning the 45-deg. chamfer. Remove part No. 3 and drill and ream the hole in the center of part No. 1 to ⅜ in. diameter to fit the plate pivot. This completes these two parts with the exception of facing the bottom of the base and drilling the screw holes for attaching the plate pivot and compass to part No. 3; and graduating part No. 1.

3. The standards and all parts supported by them should be machined and assembled before they are attached to the base plate. To insure that these parts will be central when located, a stud, the upper end of which has the same diameter as part No. 11 (the telescope tube), and the other end of which is turned to a tenon 5/16 in. in diameter to fit the hole in the center of part No. 3. The length of this stud is approximately 7 in. By its use the telescope and its supporting parts are centrally located even though there may be considerable variation in the castings from the drawing dimensions. The screw holes in the base of the standards are now transferred to the base plate and tapped.

4. Some might hesitate to make this instrument because of the apparent difficulty in graduating the base and vertical circle, parts Nos. 1 and 2. If the school does not have a milling machine equipped with a dividing head, these parts can be machined and sent out to be graduated. If the school has the necessary equipment, the difficulty is more imaginary than real. Boys should understand the principle of the dividing head and be required to figure problems of this kind. They should know that 40 turns of the handle on the dividing head will revolve the work 360 deg. One turn, then, will move the work through an arc of 9 deg. Then if a circle on the plate having a number of holes divisible by 9, say 54, be selected, 6 holes on that circle are equal to 1 degree. An ordinary lathe tool bit, ground to a 45-deg. angle and a sharp point, may then be used for the graduating. For chucking the parts to be graduated, a plate about the same diameter as the base is needed. A stud in its center is used for centering the parts. The depth of the graduations should be about .012 in. The face to be graduated must be reasonably true, therefore, or the lines will not be uniform.

5. Inasmuch as the larger parts are threaded both outside and inside with a single-point threading tool, the outside threads should be cut first. They may then be used as gauges for cutting the mating inside threads. This applies particularly to parts Nos. 32 and 40 (base ring and tripod head), 11, 12, and 13 (telescope tube, eyepiece, and cap), and 28 and 29 (compass base and cap).

PROJECTS FOR COORDINATION

Edward A. Janning, Thomas Jefferson School, Cleveland, Ohio

In the accompanying illustration are shown some of the individual projects made in the general metal room of Thomas Jefferson School.

These projects called for coördination between several departments, such as the art department, general metal shop, electrical shop, etc.

Projects requiring the coördination of several departments

The book ends were first conceived in the artroom, where the principles of design and clay modeling were taught. From a number of clay models, plaster molds and plaster casts were

made. The draft on patterns was explained; and after the pupils had cleaned up the plaster casts, a sand mold was rammed. White metal was poured in, and a resultant metal casting obtained. This first casting was then scraped and fitted up with draw-pin holes, after which it was used as the pattern from which other castings were made.

The corner-table lamp is the type of project which calls for work in modeling, foundry, machine-shop work, forging, electrical work, sheet-metal work, plumbing, and benchwork.

The base of the lamp was made in the same manner as the book ends. The casting was then placed on the lathe, and a ½-in. pipe thread cut to receive the stem. The latter is a piece of brass pipe about 12 in. long, threaded on one end. A slight bend was given to it to represent the list in a tree trunk. Two small 110-volt sockets were next fastened to the upper end of the pipe. The leaves were made of 18-oz. copper, soldered to a piece of No. 14 steel wire. These wires were in turn inserted into holes drilled in the side of the pipe or into a small disk which was later soldered on the top end of the pipe.

For a finish the leaves and upper part of the trunk were sprayed green and then tinted with black. The base, which was made to represent a sand hillock, was painted with oil paints.

TOOLMAKER'S CLAMP OR VISE

Alfred B. Grayshon, Olney High School, Philadelphia, Pennsylvania

(See Supplement No. 270)

Supplement No. 270 shows a problem that can be worked out by any average first-year, junior-high boy. It involves a number of machine operations as well as benchwork and has a real utility value when finished.

The body part is made out of a piece of 1 by 2 by 4¾-in. cold-rolled stock. Apply blue-vitriol solution to one of its 2 by 4½-in. sides. Then lay out the length, the slot, and the bevel. The machining may be done on a milling machine, or on a shaper, or on both. Locate the hole, and drill and tap it.

The slider is cut out of a piece of 1 by 1 by 1⅜-in. cold-rolled stock. Machine it to a length of 1 7/64 in. Locate the circular grooves in the sides and mill or file them in. Locate the ¼-in. hole and drill to the necessary depth.

The screw is made of a piece of ¾ by 4¼-in. C.R.S. It is machined in a lathe by facing to length, turning down to ⅜-in. diameter, and squaring the shoulder. Turn the small end as shown. Knurl the knob end coarse, file the edge round, and drill a No. 13 hole in the center.

The handle is made of 3/16-in. by 2 9/16-in. C.R.S. File the ends round in the lathe, then force the handle into the hole of the screw.

Thread the screw with a stock and die, and smooth all surfaces of the pieces with a smooth file. Drill the No. 13 hole in the side of the slider as shown so that a steel pin can be driven in to hold the screw and the slider together.

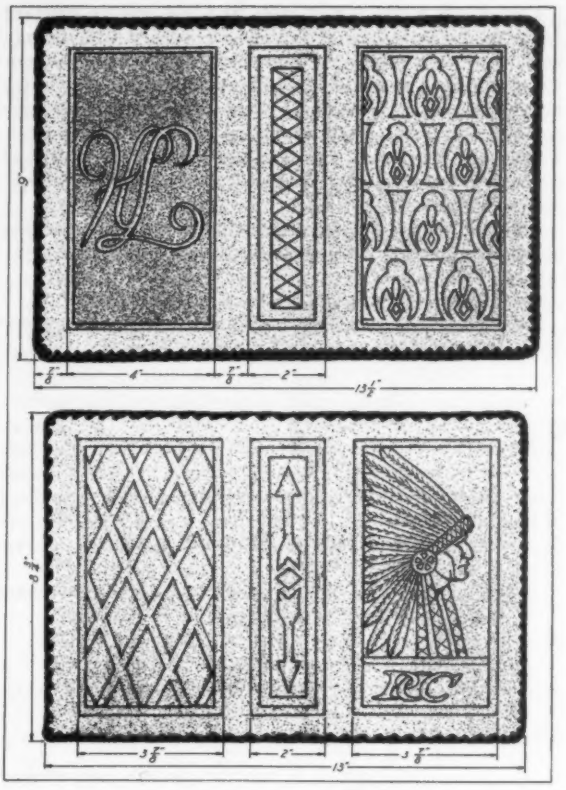
All parts are then ready to be casehardened with cyanide or Kasenite, after which they are ready for the final assembly.

LEATHER BOOK COVER

Ross C. Cramlet, Junior-Senior High School, Newton, Iowa

The average student who has made a few simple articles of leather should be capable of making the book cover illustrated herewith. Book covers of this kind are useful and they are appreciated greatly as gifts.

Book covers



Book cover details

The two covers shown are standard in size and represent designs which appeal to the average student.

In order to make the best kind of job natural calfskin should be used. This leather will stand more hard usage and give better service than a smooth-surfaced leather. It is also easier to tool. It is usual to use a wide lace for this type of work. In the book covers shown, a lacing ⅜ in. wide was used. The center locations of the holes for the lace are made a distance apart equal to the width of the lace and usually ¼ in. from the edge. The size of the hole is more or less optional according to individual taste. Special care should be used during the lacing to cover the entire edge. A suede lining, which matches well with the outside, imparts a finished effect to the cover.

After the project has been completed, dress up the scratches with a burnishing tool and apply some good leather dressing to revive the life of the leather.

FOOTSTOOLS

C. Anthony Van Kammen, Grand Rapids, Michigan

The footstool makes a fine small problem for upholstering. Its construction may be elaborate or simple, depending entirely upon the ability of the boy, and upon the time at his disposal. The one described herewith was used in the seventh grade to finish up a semester where three or four weeks still remained and the question of "What shall I make now? We haven't much time left," came up. Sizes were varied slightly to "fit" available upholstering material, for which salesmen's samples of discontinued lines, remnants, and scraps were used. Frequently suitable pieces of covering material may be salvaged out of the upholstery that has been taken off furniture which was reupholstered. Whenever possible small figured patterns should be used.

Curled hair makes a good filler, and this may be obtained from the junk yard for six or seven cents a pound. It may be obtained also from old automobile bodies and cushions. Cotton may be purchased from the upholsterer in rolls for about 15 cents a pound. Burlap may be obtained from any heavy-quality sacks. Tacks should be purchased in quantities. Four-ounce, 6-oz., 8-oz., and even some 12-oz., and 14-oz. will be required. Gimp tacks of the 3-oz. and 6-oz. size should also be kept on hand.

Figure 1 shows the seventh-grade problem. As stated, the size may be varied slightly to accommodate available material. The stock bill follows:

Upholstery Material

4 pc.	17 x 22	Burlap	Webbing and sub-top
1 pc.	2½ x 53	Burlap	Roll edge
2 lb.		Curled hair	Stuffing
1 lb.		Cotton	Stuffing cover pad
1	17 x 22	Velour, mohair, etc.	Cover
1	½ x 54	Gimp braid	Gimp
1 lb.		Cotton	Stuffing cover pad

1 pc. 11 x 15 Beaver board or heavy packing-box cardboard may be substituted for burlap webbing.

4-oz., 6-oz., 8-oz., 12-oz., and 14-oz. tacks.

3-oz. and 6-oz. gimp tacks.

The frame is of simple butt-joint construction. A tenon, as long as the frame material is wide, is formed on the end of each leg. This is done at the circular saw by sawing away, from two adjacent sides, a depth equal to the thickness of the frame stock plus the thicknesses of the fabrics to be used on the sides of the frame. (See phantom sketch in Figure 2.)

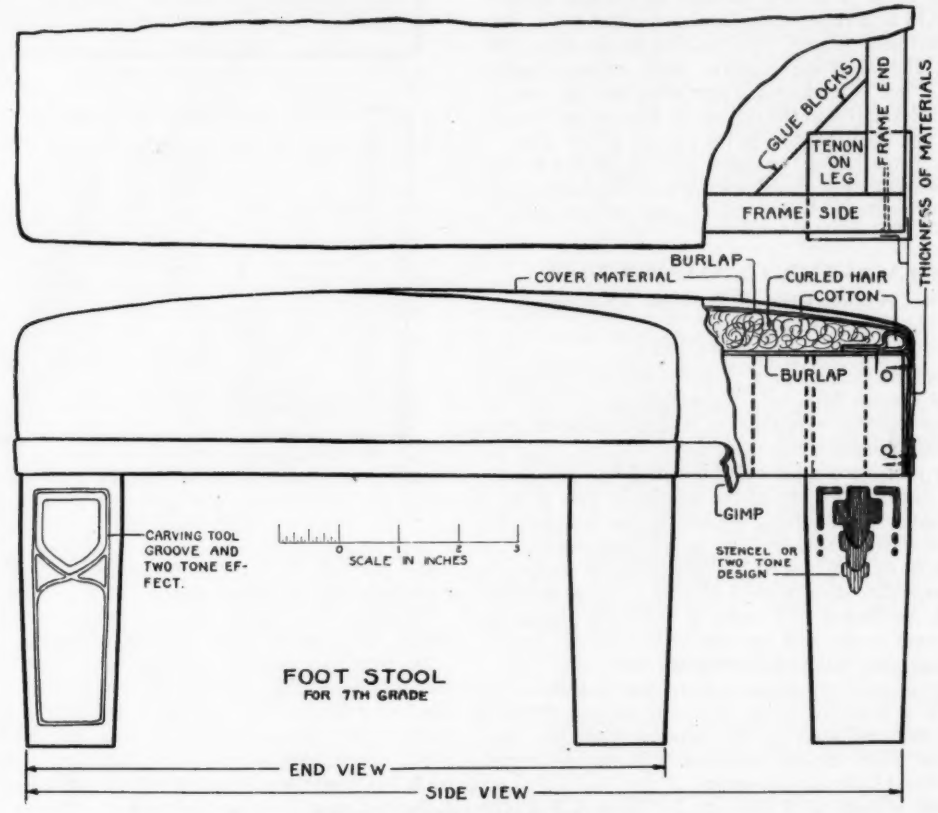


Fig. 1. Details of footstool

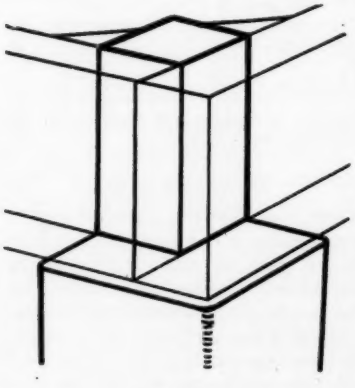


Fig. 2

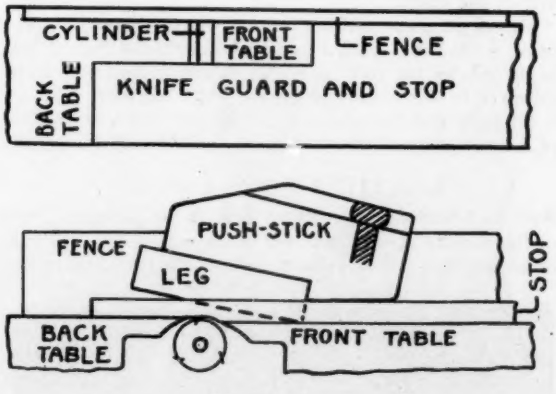


Fig. 3

Lumber

2 pc.	15 x 2 x ⅝	Bass or Pine	Sides
2 pc.	9½ x 2 x ⅝	Bass or Pine	Ends
4 pc.	6¼ x 1¾ x 1¾	Bass or Pine	Legs
8 pc.	2 x ⅞ x ⅞	Bass or Pine	Glue blocks

The legs are contoured as desired. They may be tapered on the two inside faces or on all four sides. This work is done on the 6-in. jointer. A board 6 in. wide and ¾ in. thick and long enough to reach from well on the back table to the rear of the front table, is cut out at one corner to receive the length and width of a leg. The front table is then lowered a distance equal to the taper desired. Shove this combination guard and stop board over the jointer until the stop end is the proper distance from the rear table to make the taper

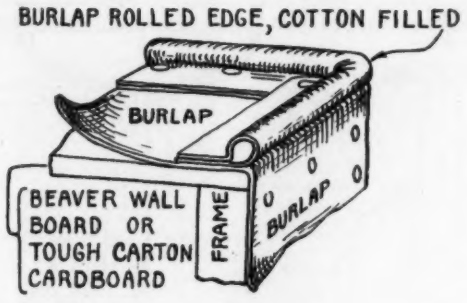


Fig. 4A

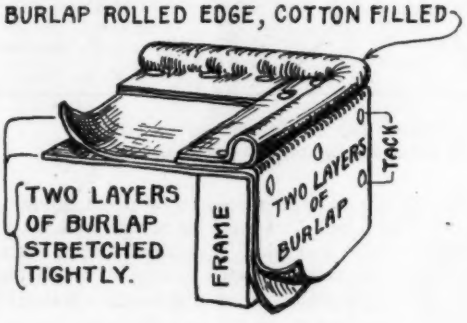


Fig. 4B

on the leg, and clamp in place. Stop the jointer, of course, while clamping the stop to the front table. A push stick is used to pass the legs over the knives. Catch the lower end of the leg against the stop, and with the left hand slowly let the leg down on the jointer knives while the right hand with the push stick holds the leg down to the table. (See Figure 3, plan and elevation.) The operation is repeated as many times as there are sides to be tapered. Care should be taken not to taper a side twice. Sand the four edges of the legs so that they will be rounded about 1/16 in. If this is done, there is less danger of rubbing through the varnish or lacquer. The legs, as completed above, are in their simplest form and are ready for the finish. Other contours may be given them such as taper-chamfering on the edges making the legs octagonal at the base, etc.

If desired, each leg may be further ornamented by stenciling a small design near the top. The better workers also might cut a fine line with a veining tool forming panel effects. Recessed panels carved in the exposed sides also add a touch of variety. The last two effects lend themselves well to paint or lacquer as color may be inserted in the veining tool groove while the recessed panels may be "shaded" around the edges. Two-tone stain effects are also appropriate and not too difficult. Give the finish desired to the legs so that they may dry while the upholstery work progresses on the frame.

If a heavy carton cardboard, or beaver wall board is available, cut a piece that will exactly cover the top and tack it in place. This gives a nice finished effect on the underside when painted. Two layers of burlap stretched tightly and tacked down the side serves equally as well and gives more spring if the stool is to be used to sit upon. When burlap only is used as a webbing, a piece of cambric should be tacked to the frame first to give a finished effect to the underside of the stool. This material also prevents dust and particles of hair, that work through the burlap, from dropping on the floor. Cut strips of burlap about 2¾ in. wide and also strips of cotton from the roll about ¾ in. wide. These two materials are to be used for a roll edge. Roll the cotton tightly in the burlap strip and tack around the edge of the cardboard or frame. Keep the roll edge hard and tight and just even with the outer edge of the frame. Drive the tacks in close to the roll, as shown in Figures 4A and 4B.

Pick a liberal quantity of curled hair so that it will be loose and springy. Pile this on to the frame so that the center is slightly higher than near the rolled edge. Keep the hair evenly distributed so there will be no "holes." Two methods are used for keeping the curled hair in place. Strips of burlap three or four inches wide are tacked along one edge and end so that they will reach over the curled hair to the other edge or end. Starting with the center strips these are drawn down over the curled hair and tacked on the opposite sides and ends. Then a second strip from each side and end are tacked in place, and so on, until all the strips are down. If there are any low places, "holes" in the curled hair, they may be evened by forcing the hair in those places with a "regulator" made from a large nail or pointed piece of heavy gauge wire.

The second method is to have a piece of burlap large enough to cover the hair and tack this along an edge. Hold the hair down and stretch the burlap over to the opposite side and tack. Draw down the ends and fasten them in place, and even up the hair as in the first method. A sheet of tin with the edges smoothed may be laid over the hair as the burlap is stretched in place. This may be withdrawn from one end later. A thin layer of cotton is tacked all the way around the sides of the frame. Small patches of cotton are laid over the depressions made by the tacks. Place a layer of cotton over the burlap-covered top and the stool frame is ready for the cover material. If the fabric pattern is a bilateral design that has a center axis and point of accent or concentration, see that the design is centrally placed upon the footstool frame. Do not drive the tacks home until the fabric is properly located. Great care should be taken not to pull the design or pattern out of

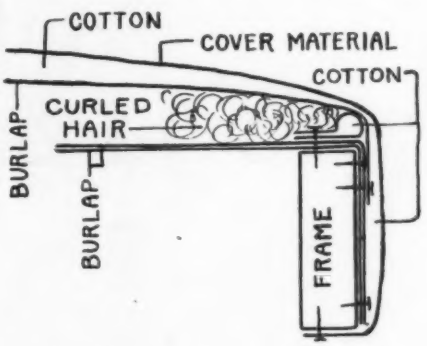


Fig. 5

shape. Draw the material to the four corners and center of the sides and gradually get all stretched neatly in place. The upholstery material may be tacked around the lower edge of the frame and the tacks covered with gimp, or the material may be neatly and evenly tacked on the under edge of the frame. If the latter method is used, the material should be mitered and glued on the underside at the corners so as not to get double thicknesses of material where the legs are to be located (see Fig. 5). Glue and screw the legs in their respective corners with a glue block on each side. A few small brads in the glue blocks will help to draw them tight.

A FOUNTAIN POOL

R. H. Jenkins, Humboldt State Teachers' College, Arcata, California

The Civic Club of our college undertook the problem of building a pool and fountain in one of the inner courts. They called upon the shops for aid in methods of construction.

The pool was purely a problem in ordinary concrete, but to build a fountain which would be practical, and yet make the construction so simple that untrained hands could do the work, was more difficult. The methods used worked so successfully that they are offered here in hopes that they may be of aid to someone else.

A working board, 6 ft. square, was first built with a rigid column in the center. To this column was fitted a revolving

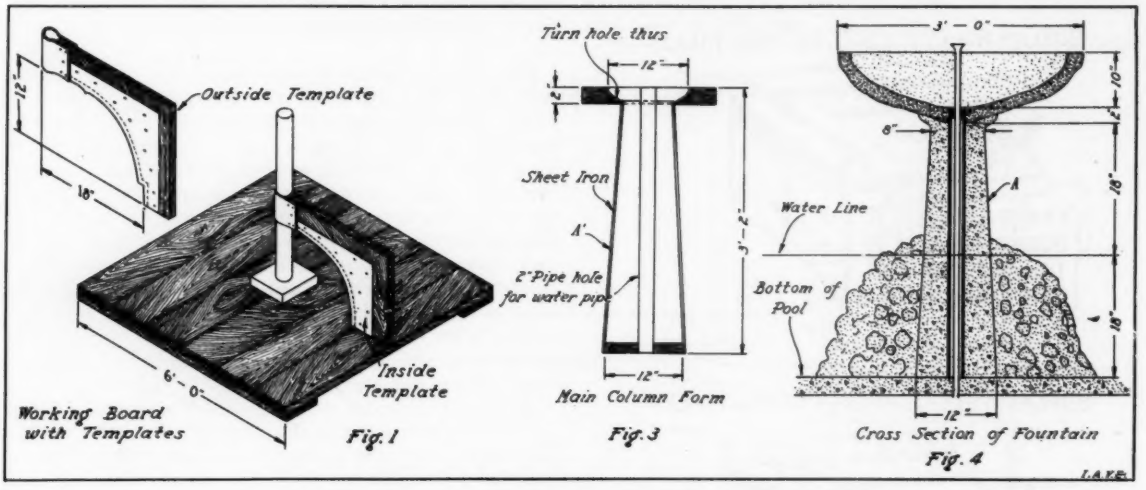


Fig. 1. An isometric drawing of the working board showing the central column and the templates. Fig. 3. The main column. Fig. 4. A cross section of the fountain

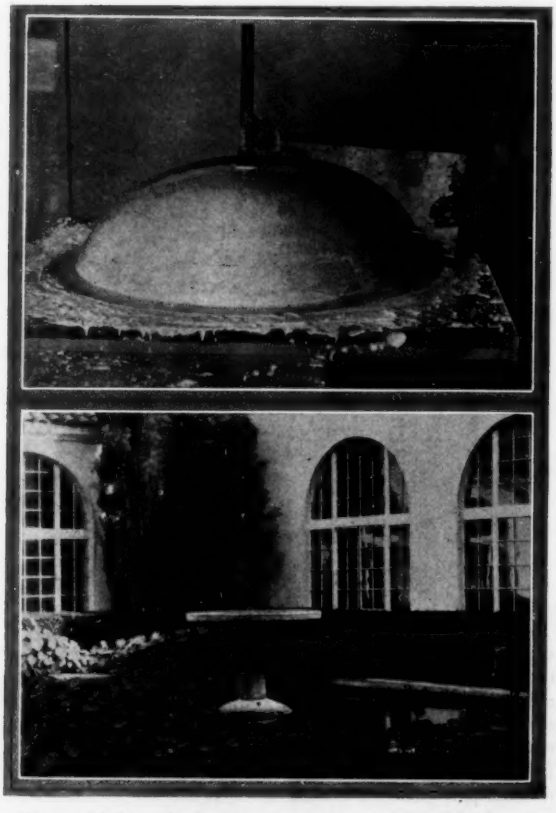


Fig. 2. Making the Bowl — This shows the working board with the core completed, and the concrete partly in place for the finished product. Fig. 5. The finished fountain and pool

template, of a size large enough to form the inside of the bowl (see Figs. 1 and 2). Around the column were piled some wastepaper towels, over which was spread a thick coating of plaster paris. The paper was used to save plaster. Before the plaster had an opportunity to set, the template was revolved, cutting an exact shape of the inside of the bowl.

When the plaster had set, the surface was covered with a coating of cup grease to guard against the sticking of the concrete.

The outside template was then fitted to the column, and the form was ready for use. A rich cement mixture was then prepared, and a heavy layer of it was applied over the entire surface of the plaster core, working from the bottom toward the center. The revolving of the template kept the concrete true to form. Strips of steel lath were used as reinforcement to further strengthen the piece. For a finish, the surface was covered with a coating of hydrated lime and cement, in the proportions of half cement and half lime, and the application was made with an ordinary paint brush.

While the bowl part was hardening, the main column was made with two pieces of wood and a strip of sheet iron as shown in Figure 3. To get the curve for the shape of the bowl, a piece of wood was turned on the lathe, while the bottom was sawed on the band saw. A piece of 2-in. pipe was fastened in the center to allow for the water main. The concrete was then poured from the top and carefully tamped to avoid blow holes.

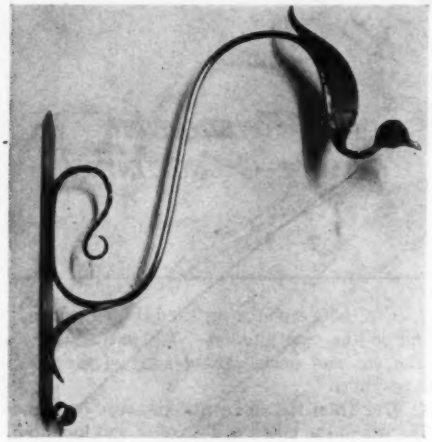
When the fountain was set in place in the pool, a mound of concrete and rocks was built up around the column as an additional support, and to give weight to the whole mass. This is shown in Figures 4 and 5. The bowl was then cemented in place upon the column, the water pipe attached, and the whole surface once more gone over with hydrated lime and cement, to which a shade of green had been added. The green gave a pleasing tone, and the hydrated lime made the bowl waterproof.

The dimensions given are only suggestive, and may be changed to fit conditions.

BIRD-CAGE BRACKET

H. M. Andersen, J. Sterling Morton High School, Cicero, Illinois

The illustration shown herewith shows a bird-cage bracket which was recently designed in the writer's class. The first step was to make a full-sized drawing on the blackboard. In order to make it easy to transfer designs from the blackboard to paper or any other material that may be used for a template, this blackboard, which is portable, has been laid off with 2-in. squares with a sharp tool. After the design of the bracket was completed and judged for proportion and balance,



Wrought-iron bird-cage bracket

a piece of soft black-iron wire was bent to conform to the drawing from the tip of the bill to the end of the tail. This wire, when straightened out, was measured and a piece of 5/16-in. round steel was cut to this length, deducting a slight amount for the taper. The end which is welded to the plate was forged square and twisted. Then, with the aid of the forming fork, the rod was shaped to comply to the curve shown in the drawing.

The material selected for the body and head of the bird was mild steel 3/16 of an inch thick. The width of the body must be determined by the size of the entire job so that the proportion will be right. After the outline of the body is drawn on the metal, the side to be welded to the rod must be shaped to the curve desired. The shape may be sawed out with a coping saw after which the edge is filed. The piece is then ready to be heated so that it can be shaped to fit the curve of the 5/16-in. rod, and the curve put into the wing.

The head is made in a similar way, and of the same kind of metal. Here also the size will vary with the problem. After having finished these two pieces, they are to be welded into place.

A strip of metal is then forged to look like a leaf and formed to fit in place. Its purpose is to support the main arm. The back plate is made of a piece of 3/16 by 2 by 16-in. material. Both ends are cut to a taper and one end is scrolled. A 3/16-in. hole is then drilled near the top part of the back and another similar hole at the bottom so that it goes through the lower part of the leaf. The arm is then welded to the plate, and the leaf to the arm. The entire piece is then rubbed with emery cloth to bring out the highlights on the hammer marks caused in the working. The project is then ready to be coated with clear lacquer.

COMBINATION HOE AND CULTIVATOR

F. M. Walter, High School, Cortland, New York

Materials:

1 pc. sheet iron 12 or 14 gauge, 4 by 6 in.
1 pc. ⅜-in. diam. iron rod, 10 in. long.
1 pc. wood, straight-grained, ⅞ by 1⅛ by 4 ft. 6 in. (A broomstick may be used.)
1 pc. No. 18 wire (hay wire) for ferrule.
2 oval-headed iron rivets, 3/16 by ½ in.
4d common nail for pin in handle.

Method:

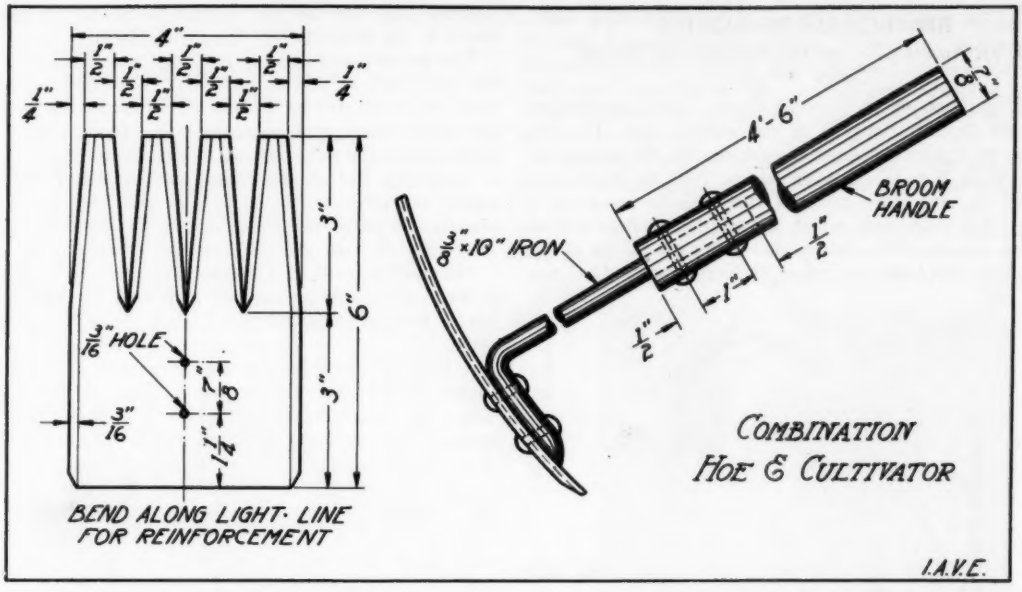
Lay out the sheet iron accurately with rule and awl. The cutting may be done with a heavy bench shears, or with a

USE OF STAINS

Since the recent arrival on the market of lacquer for a finish, it has been increasingly evident that all finishing materials did not go well with it. With this in mind, the writer has attempted to bring together in simple graphic form information that will aid the amateur in selecting the proper combination of finishing materials.

Kind of Stain	Sun Fast	Penetration	Application	Fillers	Varnish Shellac Lacquer	Advantages	Disadvantages
Water Plus analine dye	All shades		Brush or rag. Latter gives even tone (not usually wiped)		Can be varnished or lacquered over all shades except green	Richest tone, brings out grain best, leaves no brush marks	Raises grain
Spirit Alcohol plus dye				A chemical compound, much care needed in use of filler	Care needed in use of finish coats		Not usually used on refinish jobs, should be used by skilled technician not by layman. Good to let alone
Oil Pigment colors plus oil	More permanent in color than penetrating stain, not as permanent as water stain				Can finish with varnish (not lacquer)	Does not raise grain	Does not give clear tone effect as others on account of pigment content
Penetrating Benzol plus dye	Not sun fast	Deeply as no other	Requires wiping after application	Cannot be filled over in all shades (can in some)	Can be varnished over not lacquered	Does not show brush marks	Raises grain some, stain bleeds thru or lifter by lacquer (on all except water stain)

Compiled by P. S. Emerson, Cheshire, Conn. — Courtesy of Bryant W. Seaman



hack saw. File all edges smooth. Fold back the edges at right angles to give extra strength. This may be done in a machinist's vise with a riveting hammer. Drill two holes for the 3/16-in. rivets on the center line. Sharpen the cutting edge with a file making the bevel on the underside. The cultivator prongs are approximately ⅛ in. in width at the ends and are slightly bent.

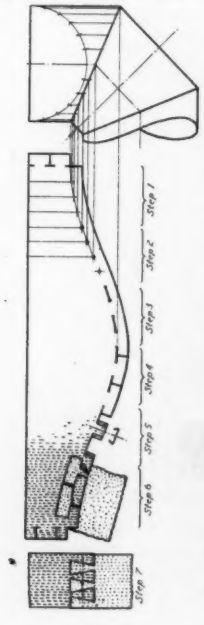
Flatten the ⅜-in. diameter iron rod at one end for a distance of 1¼ in. Drill two 3/16-in. holes for the rivets. Next, heat this end of the iron rod and bend it to an angle of a little more than 90 deg. (This angle must be determined by the feel.)

The handle should be made of straight-grained wood. Ash or similar wood may be used. The ferrule is made by winding 6 turns of wire around a prepared groove.

A LOCK JOINT FOR PAPER-DEVELOPMENT PROBLEMS

E. M. Wyatt, West Technical High School, Cleveland, Ohio

It is good to have drafting students test out development problems by cutting them out and assembling them. It also is good practice for drafting teachers to have on hand assembled models. Attempts, however, to put developments together by means of paste are sure to be disheartening. The method illustrated and described herewith shows an entirely practical lock joint that will do away with messy paste and has no fault unless it be that it must be made accurately.



Step 1. Add to the edges that are to be joined together a lap allowance of ¼ in. This allowance must be made on both of the pieces that are to be joined. This lap corresponds to the lock-seam allowance added to sheet metal.

Step 2. Step off equality spaced points of about ⅜ to ½ in. along the theoretical edges (not the lap edge) of the pieces that are to be joined. Punch these well through the paper. Space them exactly the same on both of the pieces to be joined. The plotting points can be used if they are about the right distance apart.

Step 3. Cut between the pricked-through holes with a knife point so the cuts alternate with uncut spaces as illustrated. The cut and uncut spaces must stagger on the two pieces to be joined.

Step 4. Cut from the centers of the cuts just made to the edge of the lap so the cuts are T-shaped, as illustrated. Notice how these T's stagger at the top and bottom of the development illustrated — one T at the top, one at the bottom.

Step 5. Bend upward the little flaps loosened by cutting the T's, as illustrated. This leaves the joint lap notched much like dovetailing.

Step 6. Fit the pieces to be joined together with the dovetails interlocking, like one locks the fingers of two hands, and bend the little flaps down so they lock behind one another. Put the lock side of the joint inside where it will be out of sight and incidentally support the joint.

Step 7. In tight places and on small curves it is sometimes hard to lock the above described joint. The true dovetail interlocking illustrated at the left and below the other drawing is a good one to use in such places. It holds nearly as well as the first. It will need no explanation as it is but a modification of the first one.

A VERSATILE GLIDER

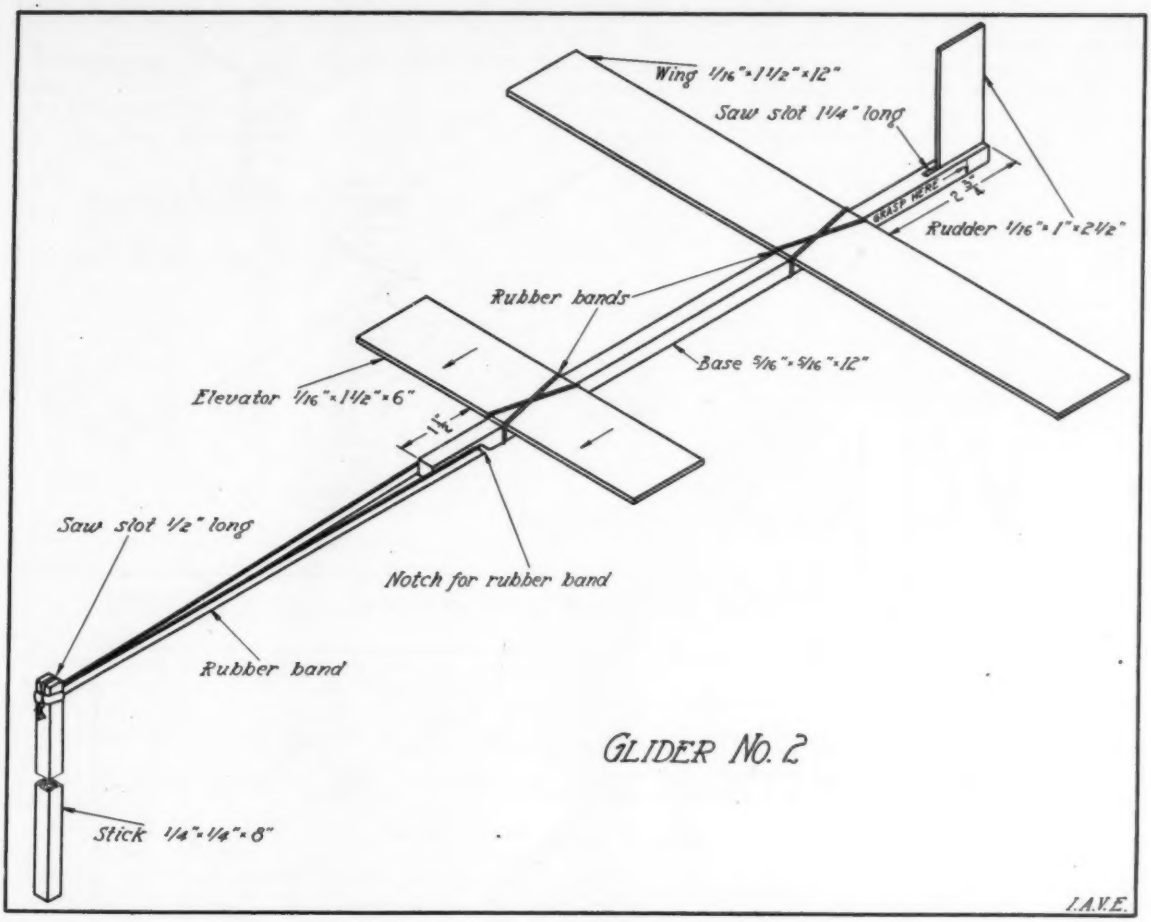
Terence Vincent, Los Angeles, California

The glider herewith described permits of several different kinds of flights, and has become quite popular with 14,000 boys who have joined the Walker's Glider Club in Los Angeles, California.

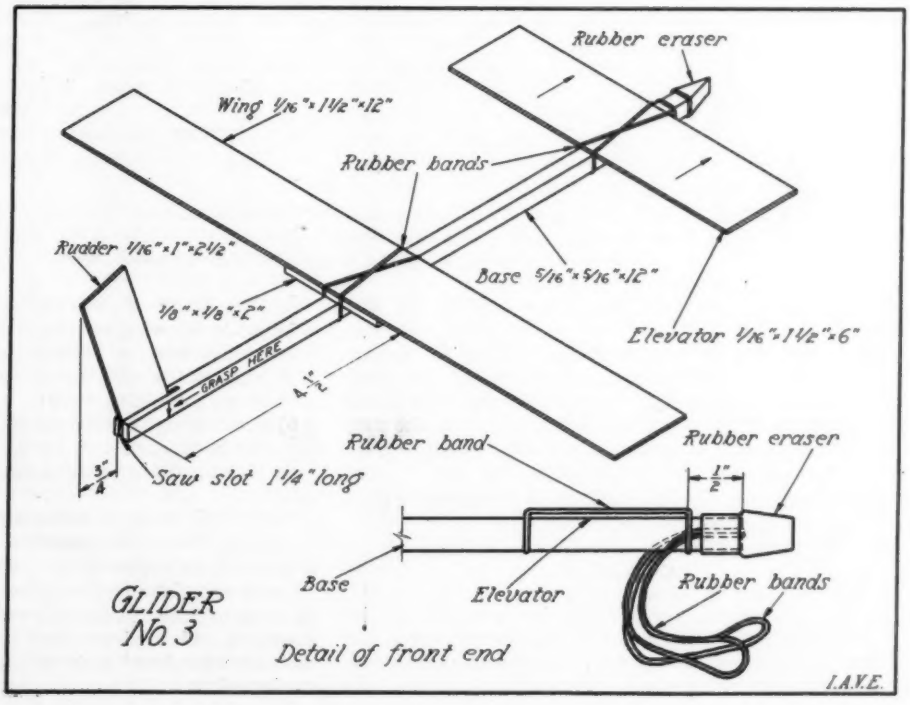
Glider No. 1 shows the simplest form. The flying results that may be obtained with it when it is tossed into the air are quite satisfying.

Glider No. 2 is made of the same parts as No. 1. The elevator is set a little farther back and the base is notched for a long rubber band. About a No. 33 will do. This rubber band may be fastened to the end of a pencil or to a stick as shown in the illustration. Holding the glider by the tail end of the base as indicated, the loose end of the rubber band is hooked into the slot, and the glider is catapulted on its way with a slingshot action. With a little practice, the glider can be made to loop and spiral at will.

Glider No. 3, as shown in the detail, has two No. 18 rubber bands fastened to the tip end of the base. The tip is protected by means of a rubber lead-pencil eraser. Instead of this eraser, a piece of rubber tubing 1 in. long may be used as is shown in Glider No. 4. To give this glider a tendency to turn,



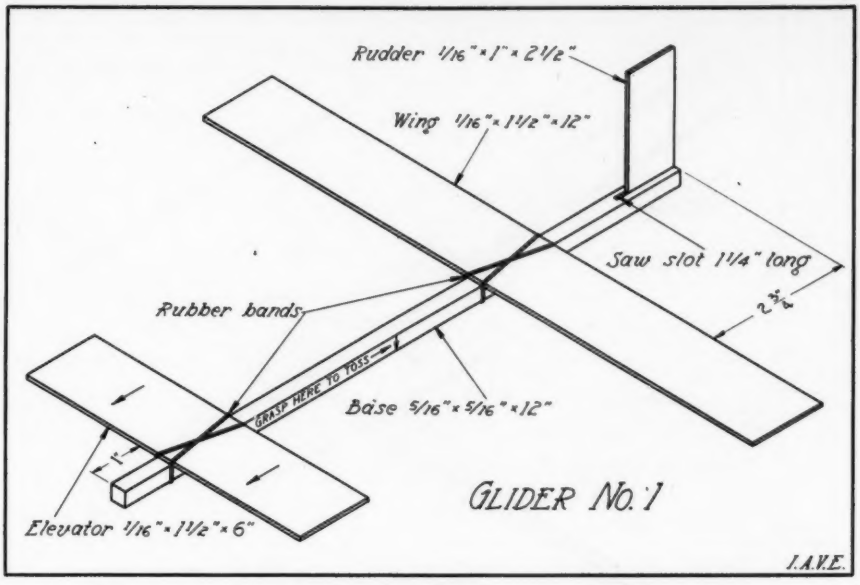
Glider No. 2 shows the adjustment that is necessary to secure level gliding when tossed for gentle flight. Rapid propulsion makes this glider turn a loop



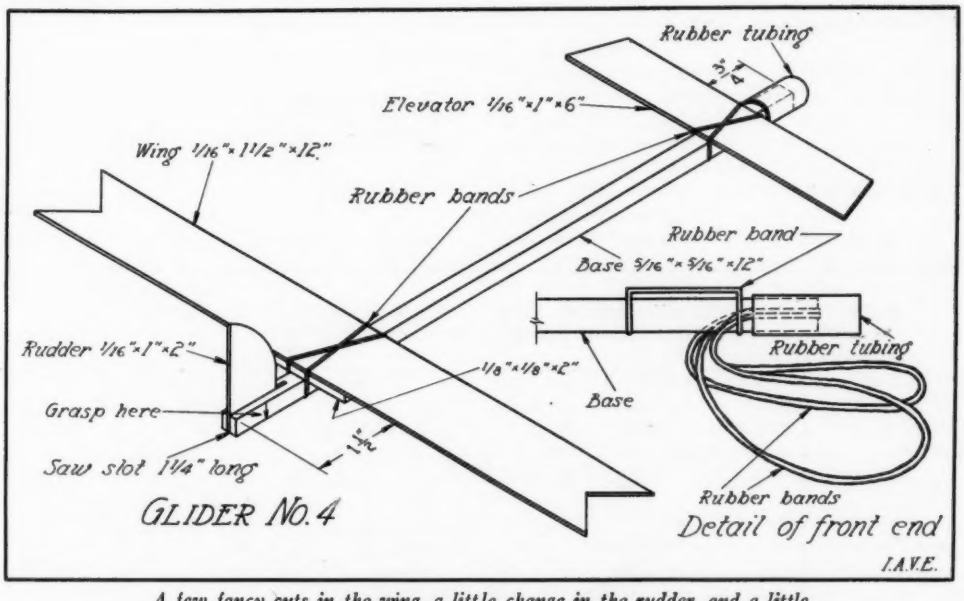
Glider No. 3 shows the arrangement which is necessary to secure a left spiral

a piece of ⅛ by ⅛ by 2 balsa is fastened to the underside of the trailing edge of the wing. This glider may be tossed or it may be launched by means of the rubber bands, using one rubber band for low-speed and two for high-speed flight. When launching it by means of the rubbers, grasp the tail end of the base with the index finger and thumb of one hand. Insert the index finger of the other hand into the loose end of the two rubber bands and stretch the rubbers back until they are about 8 or 12 in. long. Then let go of the tail, but do not flip with the throwing hand if you want well-controlled flight.

The wing or the elevator may be shifted up and down, forward and back, or side to side as desired, each producing different results in the flights.


Rudder 1/16" × 1" × 2 1/2"
Wing 1/16" × 1 1/2" × 12"
Saw slot 1 1/4" long
Rubber bands
GRASP HERE TO TOSS
Base 5/16" × 5/16" × 12"
Elevator 1/16" × 1 1/2" × 6"
GLIDER No. 1
I.A.V.E.

Glider No. 1 shows the versatile glider adjusted for straight level flight



A few fancy cuts in the wing, a little change in the rudder, and a little color added to this glider made it a real Christmas toy

Glider No. 4 is made very much like Glider No. 3 except that the elevator, wing, and rudder are shaped somewhat differently. The base and the wing may be colored red, and the rudder and the elevator green. Red rubber tubing also may be used. The suggested colors are especially appropriate on gliders that are made to be used as Christmas gifts.

CIRCULAR SAWS, THEIR CHARACTERISTICS AND USE—VI

John E. Doren, Supervisor of Industrial Education, Eureka, California

(Continued from March)

Section III — Smooth-Cutting Saws

The Circular Combination Hollow-Ground Saw

•This saw is also called the miter saw, smooth-cutting novelty saw, and the planer saw.

A. The purpose of the combination hollow-ground saw is convenience, accuracy, and smoothness of cut.

1. A wide variety of work is possible with one blade.

a) Ripping (the dividing of lumber along a line of the grain at any point in its width).

b) Crosscutting (the dividing of lumber across the grain at any point in its length).

c) Mitering (the dividing of lumber at any angle across the grain).

Note: This range of cutting is possible only when the saw is in a first-class cutting condition. If the saw is slightly dull it may still be used for light cutting, such as trimming the edges or ends from lumber where the material cut off is not sufficient to pinch the saw. It is recommended that the saw be sharpened without delay when it shows signs of becoming dull. The saw should never be used if it is very dull at the cutting points.

2. This saw is designed for cutting *well-seasoned lumber* only:

a) Lumber that is thoroughly dry and free from internal stresses.

(1) Evenly dried throughout.

(2) Free from casehardening.

SECTION THROUGH HOLLOW GROUND SAW
THE BLADE IS THE SAME GAUGE AT THE RIM AND THE EYE WHEN NEW. BUT THINNER NEAR THE COLLAR LINE

FIG. 13

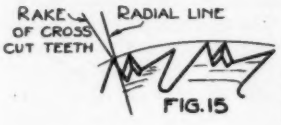
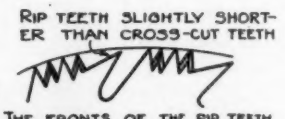


FIG. 15



THE FRONTS OF THE RIP TEETH ARE HOOKED. THE FRONTS SHOULD BE TANGENT TO A CIRCLE ⅛ TO ¼ OF THE DIAMETER OF THE SAW AND CONCENTRIC WITH IT.

FIG. 16

Note: Lumber that is not thoroughly seasoned may be trimmed on edges and ends but must not be ripped or crosscut with a hollow-ground saw.

3. This saw is designed for smoothly cutting *properly prepared lumber.*

a) Lumber with true, flat, and smooth faces.

b) Lumber with true, straight, and smooth edges.

4. This saw is designed for accurate and smooth cutting where accuracy and smoothness of cut are more important than speed.

5. The saw is designed especially for trim sawing, viz., light cutting.

a) For trimming the edges of properly prepared lumber.

b) For trimming the ends of properly prepared lumber.

B. Characteristics of combination hollow-ground saw:

1. The body of the saw blade is hollow-ground from the rim to the collar line, as shown in Figure 13.

2. The hollow-ground saw is easily identified by the ridge at the collar line, as shown in Figure 14.

3. The teeth are in groups:

a) Two crosscut teeth and one rip tooth for saws that are used mostly for ripping.

b) Four crosscut teeth and one rip tooth for saws used about equally for crosscutting and ripping. This combination is the one most often used (see Fig. 16).

4. The crosscut teeth have raking front edges to prevent the splintering of material when cut, whether it is hard or soft wood (see Fig. 15).

5. The crosscut teeth are filed with a bevel of approximately 45 deg. on the fronts.

6. The rip teeth are dressed slightly shorter than the crosscut teeth (see Fig. 16) — approximately 1/64 to 1/32 in. — to prevent the splintering of wood that is crosscut.

7. Side clearance: There is positively no set or swage in the teeth; the hollow-grinding of the sides of the saw provides all of the clearance necessary for the cutting of dry, well-seasoned lumber.

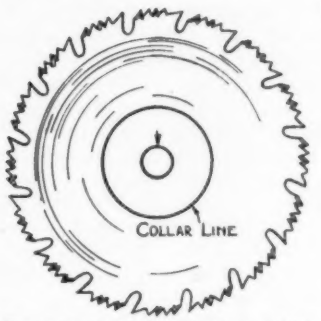
C. The cutting action. The combination hollow-ground saw is *slower cutting* than a regular rip- or crosscut saw, and *must not be forced to cut;* its use is not recommended where speed is more important than smoothness of cut.

1. Ripping is slower because there are fewer rip teeth than in a regular ripsaw of the same diameter.

2. Crosscutting must be slower because of the presence of rip or raker teeth. The crosscut teeth will score only 1/64 to 1/32 in. deep at most for each group of teeth before a rip tooth comes into action. If the cutting is hurried or forced, the rip teeth will cut deeper than the scoring, and tear splinters from the wood.

D. Operation of the hollow-ground saw:

1. The saw blade and collars *must be clean.* When placing a hollow-ground saw on an arbor, both sides of the saw should be wiped clean, and the collars and washers should also be wiped clean and free from dust and gum. Any lumps of dust, gum, or pitch, adhering to the collars, washers, or to the saw within the collar line, may cause the saw to run with a wabble, in which case it will not make a clean, smooth cut.



THE HOLLOW GROUND SAW IS EASILY IDENTIFIED BY THE RIDGE AT THE COLLAR LINE

FIG. 14

(To be Continued)

Associations, Conventions

WESTERN ARTS CONVENTION

The fortieth anniversary convention of the Western Arts Association which met at Columbus, Ohio, May 3, 4, 5, and 6, 1933, was attended by what might be termed, considering the times, a record-breaking crowd. Needless to say, many who were not there would like to have been in attendance.

The halls of the Deshler-Wallick Hotel, where most of the meetings were held, were crowded with art exhibits and some exceedingly fine school-shop work also was exhibited.

The industrial-arts sectional meetings were uniformly well attended. The one on Thursday morning, which was presided over by Mr. F. R. Kepler, Supervisor of Drawing, Detroit, was practically turned over to the drafting teacher. At this meeting Prof. Otto A. Hankammer, State Teachers College, Pittsburg, Kans., spoke on "The Derivation of Drawing Content"; Mr. E. A. Hauenstein, Supervisor of Industrial Arts, Lima, Ohio, on "Public-School Applications"; Mr. Glenn L. Roberts, Ohio State University, on "The Drawing Room of the Future"; and Mr. Frank C. Moore, Assistant Supervisor of Industrial Arts, Cleveland Public Schools, on "Summary and Appraisal of Values."

So well timed were these various addresses that promptly at 10:30 could be turned over to Mr. Elmer W. Christy, Director of Industrial Arts, Cincinnati, after which "The Various Problems of Supervision" were discussed by Dr. Harold B. Alberty, Ohio State University. Mr. John E. Fintz, Assistant Supervisor of Industrial Arts, Cleveland, spoke on "Organizing Instructional Material Through Centralized Supervision," and Mr. Elmer A. Stephan, Director of Art, Pittsburgh Public Schools, spoke on "Inspectional, Critical, and Creative Supervision."

At the general session Thursday afternoon, Mr. Maris M. Proffitt, Educational Consultant and Specialist in Guidance and Industrial Education, U. S. Office of Education, Washington, D. C., presided. At this time the administrative viewpoint was the keynote of the discussion. Dr. George F. Zook,

President, The University of Akron, and Charles H. Lake, Assistant Superintendent of Schools, Cleveland, gave addresses.

At the banquet Thursday evening, the former presidents of the Association were guests of honor. The president's address, given by Dr. Wm. E. Warner, of the Ohio State University, may have acted as an examination of conscience to many a teacher, supervisor, and administrator. At any rate, it no doubt started many at "wondering" whether what they were doing was really the thing to do. Commodore Waldo Wright and his able assistant, Ralph Newing, covered themselves and the "Ship" which they represented, with glory. Mr. Fujiama Hiroshige Pajyama, Court Artist to His Majesty, the Emperor of Japan, is to be complimented on his fine exhibition in painting the Commodore.

The industrial-arts section on "Organization Problems" at which Mr. Howard Carter, Supervisor of Industrial Arts, Hamilton, Ohio, presided, was also well attended. Mr. Allen A. Nellis, Supervisor of Industrial Arts, Athens, Ohio; Mr. Lawrence F. Ashley, State Teachers College, Charleston, Ill.; and Earl L. Bedell, Supervisor of Industrial Arts, Detroit, were the speakers.

In the industrial-arts section on Friday afternoon, presided over by Gerald G. Pugh, Director, Poppenhusen Technical Institute, New York, the speakers were Mr. George C. Decker, Fairview High School, Mr. Herbert C. Ruckmick, State Normal School, Bellingham, Wash., and Prof. Robert W. Selvidge, University of Missouri.

At the Industrial-Arts Research Section, Saturday morning, presided over by Mr. Fred C. Whitcomb, Miami University, Oxford, Ohio, Mr. Burl N. Osburn, State Teachers College, Millersville, Pa., discussed "Objectives Validation and Other Researches"; Mr. Orville E. Sink, Ball State Teachers' College, Muncie, Ind., spoke on "Researches in School Shop Planning"; and Mr. Charles A. Bennett, Industrial Education Magazine, Peoria, Ill., spoke on "Historical Research in Manual and Industrial Arts."

At the Arts Fraternity Banquet, the national honorary professional fraternity in industrial arts and vocational industrial education, home economics, architecture and allied arts, and in vocational education met and had an exceedingly interesting program.

At the business meeting on Saturday, Mr. Alfred G. Pelikan, Director of the Milwaukee Art Institute, Milwaukee, Wis., was elected president of the Western Arts Association; Mr. Frank C. Moore, Assistant Supervisor Industrial Arts, Cleveland, Ohio, vice-president; and Miss Grace M. Baker of Colorado State Teachers College, auditor.

Detroit will be the scene of the 1934 convention.

MICHIGAN INDUSTRIAL-EDUCATION SOCIETY MEETING AT MUSKEGON

The sixth annual meeting of the Michigan Industrial-Education Society was held April 20–22, at Muskegon, with an attendance of 250 members. Mr. Frank McCrea, vice-president of the society, was in charge of the program.

The meeting opened with an administration supper, at which John A. Craig, of Muskegon, delivered the address of welcome. He was followed by Dr. A. G. Umbreit, of the Muskegon Junior College, who spoke on "Future Men of Industry." Two further speakers at the meeting were Mr. Frank O. Holt, of the University of Wisconsin, and William B. Stout, of Dearborn, Mich. Lieut. Col. Floyd E. Evans told of plans for introducing interesting material on aviation into public-school courses.

Mr. F. E. Searle, director of the Henry Ford Trade School, Dearborn; Albert Sobey, Flint; H. L. Harrington of Detroit; W. D. Layton of Detroit; and R. T. Guyer of Muskegon, were among those who participated in the various sectional programs. Mr. Charles D. Dawson, Grand Rapids, spoke on "The Age of Accident Prevention," in which he impressed on the teachers their responsibility for safety education as a part of the shop instruction.

There were many exhibits, but the one from Grand Rapids was especially interesting. The "Ship" as usual did its part in the commercial exhibits and in furnishing prizes to the holders of lucky numbers.

The following officers were elected: President, Frank McCrea, Muskegon; vice-president, Harry Burnham, Flint; secretary-treasurer, A. H. Meyer, Grand Rapids. — *Alfred H. Meyer.*

INDIANA INDUSTRIAL-EDUCATION ASSOCIATION MEETS AT MUNCIE

The meeting of the Indiana Industrial-Education Association, held April 7 and 8, at Muncie, was of unusual merit. One day was given over to visiting the Muncie city schools, the Ball Teachers' College, and commercial and school exhibits. At the banquet at which Mr. G. F. Weber presided, addresses were made by Supt. D. W. Horton, of Muncie, John Dillon, of Bloomington, Ammon Swope, of Purdue University, Harry E. Wood, of Indianapolis, Dr. W. T. Bawden, Industrial Education Magazine, Peoria, Ill., and Pres. L. A. Pittenger, of Ball Teachers' College.

The program on Saturday was given over mainly to sectional meetings. There were twelve sections, each representing a different group of teachers. At the general meeting Mr. Dewitt Morgan, Indianapolis, spoke on "Economy of Guidance."

The exhibits which were housed in the Muncie Field House, were representative of a wide range of shop activities. A feature of the exhibits was the homemade machinery and equipment. The Ball Teachers' College had on display a general industrial-arts laboratory of twelve units of work which attracted a good deal of attention.

At the business meeting, Mr. Harry E. Wood of Indianapolis, was elected president, and Mr. Otto N. Yeager of Gary, vice-president. — *O. E. Sink.*

INDUSTRIAL-EDUCATION CLUB AT PITTSBURGH UNIVERSITY

A group of industrial-arts teachers of Western Pennsylvania met at East Pittsburgh, on May 13, for the purpose of organizing an industrial-arts teachers' club at the University of Pittsburgh. Supt. James Killius, of Johnstown, who acted as chairman of the meeting, gave an interesting talk on the problems of industrial-arts teachers at the present time. Other speakers were Dr. G. D. Whitney, Dr. A. M. Goldberger, H. L. Spencer, and H. S. Resides.

At the business meeting, Mr. J. Ernest Wagner, Johnstown, was elected chairman, and Dr. A. M. Goldberger, Pittsburgh, secretary.

A committee, consisting of J. W. Fleming, Chester S. Shaw, and John D. Rogers was appointed to draw up a constitution and report at the next meeting. An executive committee was appointed, consisting of H. L. Spencer, George C. Donson, and Alex Booth. — *George C. Donson.*

MOHAWK VALLEY TEACHERS' ASSOCIATION MEETS

The final meeting of the Mohawk Valley Teachers' Association was held May 23, at Little Falls, N. Y.

After a dinner served by the pupils of the home-economics department, a number of school shops were visited. Following the general program, a business meeting was held at which Mr. G. O. Wilber, Little Falls, was elected president, and Mr. L. H. Burnham, Illion, vice-president.

A total of seven meetings were held by the association during the past year. Each meeting was held in a different locality so that the members had an opportunity to see many types of shops. These meetings stimulated discussions on many topics and were the result of much professional growth and good-fellowship. — *G. O. Wilber.*

The School Shop Shopping Guide

Accurate to 1 degree

Shock-proof, will not "ground"; automatically safe, no water to boil dry, nothing to regulate or forget. OK'd by Underwriters. Unconditionally guaranteed for 1 year. The standard pot of the woodworking industry.

30-Day Free Trial

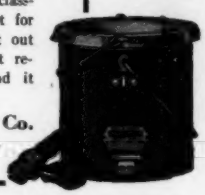
Run a test in your classroom. Use a Hold-Heet for 30 days. If it doesn't out perform any other pot regardless of price, send it back.

Russell Electric Co.
364 W. Huron St.
Chicago, U.S.A.

At Your Jobber

1 qt. . $14
2 qt. . $17
4 qt. . $24
8 qt. . $36

115 or 230 Volts.

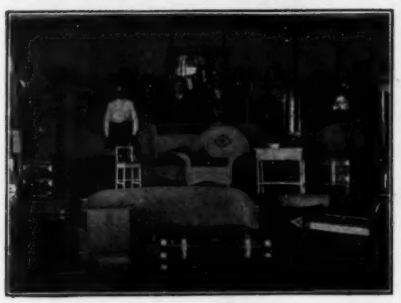


Puzzles in Wood

By E. M. Wyatt

Complete working drawings for making your own puzzles — interesting and educational. 60 cents

The Bruce Publishing Company — Milwaukee



Illustrating excellent results obtained in a small Michigan community.

New Easy Method of
FURNITURE WEAVING
Packs a Real Thrill

IT'S just as fascinating teaching it, as to boys and girls learning it. And so many unusual projects may be worked out — at so little cost. Moreover, no special equipment or power is required. Scores of practical projects, each one carefully worked out and supplied to you with simplified instructions, and all necessary materials. Plan now to give this new treat to your classes this Fall.

Send Today for Our 1933 Catalog

Shows over 100 practical projects your classes can make; tells all about this fascinating work.

Use this Coupon **NOW**

Grand Rapids Fibre Cord Co.
Dept. A, 609 Myrtle Street
Grand Rapids, Michigan

Rush a copy of your 1933 Catalog.

Name.....

Address.....

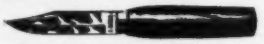
School.....

R·MURPHY STAY SHARP 1850 KNIVES
MADE SHARP AND STAY SHARP

CUT TRUE — LAST LONGER

In School Shop Use

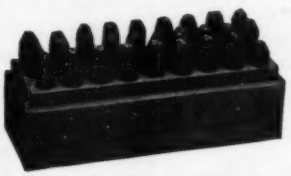
Truly knives of outstanding quality. Every R. Murphy knife is especially designed for a specific service. The steel used is absolutely uniform, providing a blade that will hold its cutting edge over long periods of use and abuse by students.



We have a complete line of Sloyd, Manual Training, Stencil and Wood Block Knives. Write for a catalog

ROBERT MURPHY'S SONS CO.
AYER, *Est. 1850* MASS.

STEEL STAMPS
Alphabet and Figure Sets



Special Steel Stamps for marking Tools, or equipment. Made to order.

Catalog sent on request

The Schwaab Stamp & Seal Co.
547 N. Water St. Milwaukee, Wis.

HANDCRAFT SUPPLIES

Rattan, Reeds, Chair Cane, and Webbing. Raffia, Hong Kong Grass, Fibre, and Fibre Rush. Paints, Varnishes & Shellac, Dyes.

Everything for Handcraft work.

J. W. WARNECKE CORP.
Grand and Second Sts. Hoboken, N. J.

BASKETRY SUPPLIES

PRIME REED, large assortment Colored Raffia, Chair Caning, and Weaving Supplies. Everything for the Handcraft Worker.

Catalogue on request

AMERICAN REEDCRAFT CORPORATION
130 Beekman Street New York City

ART METAL *and* JEWELRY WORK

Equipment and Supplies

Tools of all kinds for Jewelry, Silver, and Copper, Rose Hammers and Anvils. When ordering be sure to

SPECIFY "ROSE"

Gold, Silver, Copper, Brass, Pewter, and Nickel Silver in sheet and wire form. Semi-Precious stones. Send for our catalog B. Ask for a sample copy of our Brochure, "Things In and About Metal," sent free.

METAL CRAFTS SUPPLY CO.
Providence, R. I.

VANDERCOOK

PROOF PRESSES

A School Shop Essential

VANDERCOOK & SONS, Inc.
910 N. Kilpatrick Ave.
CHICAGO, ILL.

No. 1

SUPPLY SERVICE

In Leather, Metal, Celluloid, Wood Carving, Batik, Rope and Cordage; also Primitive Indian Crafts for the Educational, Recreational, and Occupational Fields.

HANDICRAFT MANUAL

300 Projects, 400 Illustrations, Price $1 Paper—$2 Cloth. Sent on Approval Price List on Request

HANDICRAFT SPECIALTIES
TOOLS MATERIALS INSTRUCTIONS
LESTER GRISWOLD
COLORADO SPRINGS, COLORADO

COLUMBIAN VISES

All Styles and Sizes for Every Shop Need.

Made by
The Columbian Vise & Mfg. Co.
9017 Bessemer Ave. Cleveland, Ohio

PEWTER
AND BRITANNIA METAL

Sheets: 24"x36" or smaller
Circles: 2" to 24" diameter
Specify size and gauge.

NATIONAL LEAD CO., DEPT. P
New York Chicago St. Louis

Hand Craft Projects

Book III

by F. I. Solar

An excellent book for elementary woodworking classes. This book, following the same plan as Books One and Two, presents a fine variety of simple woodworking projects, including toys, home appliances, and furniture pieces, all carefully described and illustrated.

Cloth, 157 pages. Price, $1.25.

Send for your copy today.

THE BRUCE PUBLISHING CO.
524-544 No. Milwaukee St. Milwaukee, Wis.
New York Chicago

INDUSTRIAL ARTS AND MANUAL TRAINING SUPPLIES

AT LOW PRICES

We carry the country's most complete stock of art metal tools, small motor-driven metal and wood-working machines, general hardware and Manual Training supplies; also brass, copper, pewter, sterling silver, nickel silver, aluminum and steel, available in strips, sheets, bars, wire, rods and tubing. Let us quote on your needs. Write for a list of our Technical Books.

PATTERSON BROTHERS 27 PARK ROW DEPT. A NEW YORK, N.Y.

FANCY LEATHERS
For Craft Workers

A 5-cent stamp brings you samples

Sold by the whole or half skin, also cut to measure

Tools, designs, lacings, both in Calf and Goat skin, Snap Fasteners to match leathers, Leather Dye, Wax Polish, Sphinx Paste, Slide Fasteners and Bag Plates.

W. A. HALL
250 Devonshire St. Boston 9, Mass.

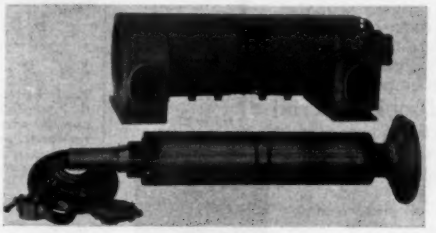
INDEX *to* ADVERTISEMENTS

Badger Electrotype Co. ..... 3rd Cover
Bruce Publishing Company..... 4th Cover
Delta Specialty Company..... 3rd Cover
Dietzgen Company, Eugene.....3rd Cover
Grand Rapids Fibre Cord Co..... 5a
Hall, W. A..... 6a
Klise Manufacturing Co. 2a
Metal Crafts Supply Company 5a
Morgan Vise Company 1a
Mummert-Dixon Co. .. 1a
Murphy's Sons Co., Robert 5a
Nicholson File Company 1a
Patterson Bros..... 6a
Pep Mfg. Company... ..... 3rd Cover
Rockford Machine Tool Co. 1a
Russell Electric Co. ... 5a
Schwaab Stamp & Seal Company 5a
School Shop Shopping Guide...5a & 3rd Cover
South Bend Lathe Works 2a
Stanley Rule & Level Plant 2a
Wallace Company, J. D. 2a
Yates-American Machine Co..... 4a

SchoolShopEquipmentNews

NEW ALLIS VERSATILE-TYPE MOTOR

The Louis Allis Company, of Milwaukee, Wis., is marketing a new motor, which though only 12 in. in diameter, is capable of delivering 100 h.p.



A 100-h.p. motor

This motor is ideal for directly mounted grinding wheels, saws, cutter heads, etc., where the diameter and peripheral speed of the cutting tool must be held to a minimum.

LUFKIN ALL-STAINLESS TAPE RULE

The Lufkin Rule Company, Saginaw, Mich., has just announced its new No. S-696 "All-Stainless Crescent" tape rule. The rule is made of genuine stainless steel, which automatically winds into a sturdy case 2 in. in diameter. When withdrawn it becomes rigid like a rule. The sliding end hook adjusts itself to accurately take either butt end or hook measurement. With the hook pushed back, the rule may be inserted in a narrower slot than the hook would enter. The blade has clean-cut, prominent dark markings and figures and is very readable.

NEW SERVICE IN WROUGHT-IRON WORK

The Wrot Iron Designers, 541 West 35th St., New York City, have just announced a new service which will be of interest to the teacher of metal work in the school shop.

The announcement of this service includes departments on metal homecraft designs and kits of material, materials hard to get, metal-working tools for the shop, publications of wrought-iron designs, special designing service, and free advice and consulting service.

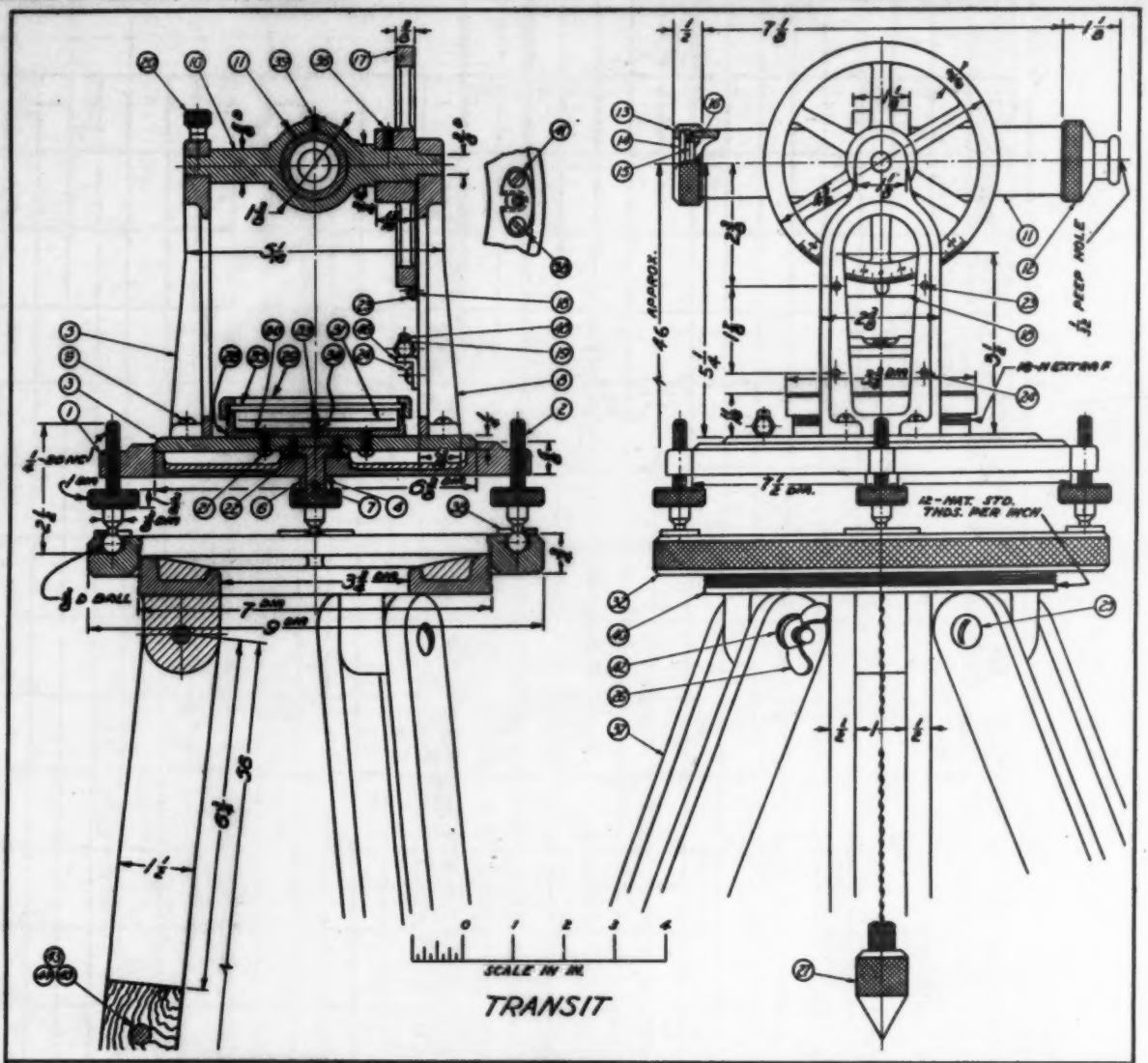
Information about the new service may be had on application.

PERSONNEL CHANGES IN THE PRINTING MACHINERY COMPANY

Mr. Hugo Lindberg of the New York office of The Printing Machinery Company, of Cincinnati, Ohio, has been appointed eastern manager for the firm. Mr. Lindberg is well known to the printing trade in the East and South. His headquarters will be in the Printing Crafts Building, 461 Eighth Ave., New York City.

Mr. Ross B. Schleuter, the western manager of this firm, has his offices at 20 West Jackson Blvd., Chicago, Ill.

To be Reproduced for School Shop Use Only
Copyright, 1933, The Bruce Publishing Company



TRANSIT

BILL OF MATERIALS

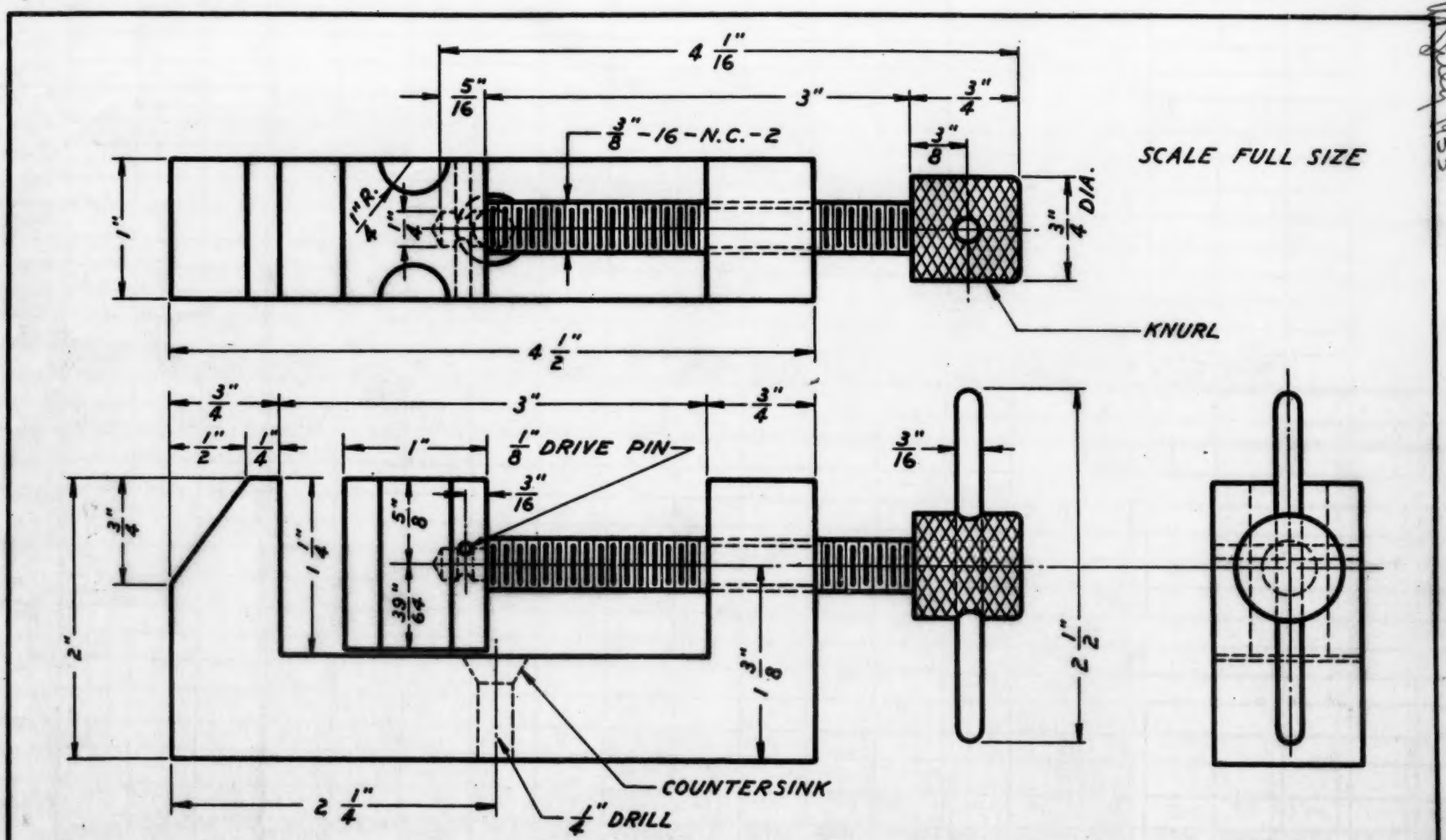
NO.	NAME	REQD.	MATL.	REMARKS	NO.	NAME	REQD.	MATL.	REMARKS
1	BASE	1	AL. CSTG.		25	STEP BOLTS	3	BR.	3/8 - 16 N.C. × 2 3/4
2	LEVELING SCREW	4	BR.		26	WING NUTS	3	BR.	3/8 - 16 N.C.
3	BASE PLATE	1	AL. CSTG.		27	PLUMB BOB & CORD	1	BR.	CORD
4	PLATE PIVOT	1	BR.		28	COMPASS BASE	1	AL. CSTG.	
5	L.H. STANDARD	1	AL. CSTG.		29	COMPASS CAP	1	AL. CSTG.	
6	PIVOT COLLAR	1	BR.		30	COMPASS CARD	1	BRISTOL	
7	PIVOT COLLAR PIN	1	BR.	1/8 × 3/4	31	COMPASS NEEDLE	1	ST.	MAGNETIZE & BLUE NORTH
8	R.H. STANDARD	1	AL. CSTG.		32	BASE RING	1	AL. CSTG.	
9	RD. HD. MACH. SCR.	4	BR.		33	NEEDLE CAP	1	BR.	
10	SHAFT	1	AL. CSTG.		34	NEEDLE PIVOT	1	BR. & ST.	
11	TELESCOPE TUBE	1	AL. PIPE	1 DIA. × 7 5/8	35	COMPASS CRYSTAL	1	GLASS	3 1/2 DIA. × 1/32
12	EYE PIECE	1	AL. CSTG.		36	HDLESS SET SCR.	1	BR.	NO. 10 - 24 N.C. × 7/16
13	TELESCOPE CAP	1	AL. CSTG.		37	TRIPOD LEG	3	BIRCH	OIL & VARNISH
14	TELESCOPE GLASS	1	PLAIN GLASS	1 1/4 DIA. × 3/32	38	LEVELING SCR. SHOE	4	AL.	1/8 STOCK
15	CROSS WIRES	2	COP.	.003 NO. 40 AWG.	39	HDLESS SET SCR.	1	BR.	NO. 10 - 24 N.C. × 5/16
16	CROSS WIRE RING	1	AL.		40	TRIPOD HEAD	1	AL. CSTG.	
17	VERTICAL CIRCLE	1	AL. CSTG.		41	FLAT HD. MACH. SCR.	8	BR.	NO. 10 - 24 N.C. × 1/2
18	INDICATOR	1	AL.	1/8 STOCK	42	WASHER	3	BR.	FOR 3/8 STEP BOLT
19	LEVEL	2	BR.	NO. 31 STANLEY × 2 IN.	43	MACH. BOLT	3	BR.	1/4 - 20 N.C. × 2 1/4
20	LOCK SCREW	1	BR.		44	HEX. NUTS	3	BR	1/4 - 20 N.C.
21	RD. HD. MACH. SCR.	2	BR.	NO. 6 - 32 N.C. × 3/8	45	WASHER	3	BR.	FOR 1/4 BOLT
22	FLAT HD. MACH. SCR.	4	BR.	NO. 6 - 32 N.C. × 3/8	46	LEVEL CLAMP	2	AL.	1/8 STOCK
23	RD. HD. MACH. SCR.	2	BR.	NO. 6 - 32 N.C. × 3/4	47	LEG TIP	3	RUBBER	3/4 DIA. CRUTCH TIP
24	RD. HD. MACH. SCR.	2	BR.	NO. 6 - 32 N.C. × 5/16	48	RD. HD. MACH. SCR.	4	BR.	NO. 6 - 32 N.C. × 1/2

Designed by H. D. Campbell and J. W. Strahl, Cicero, Ill.

Described Elsewhere in This Issue

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
TRACING SUPPLEMENT, No. 270, JULY, 1933

To be Reproduced for School Shop Use Only
Copyright, 1933, The Bruce Publishing Company



TOOLMAKER'S CLAMP OR VISE

I.A.V.E.

Submitted by Alfred B. Grayshon, Philadelphia, Pa.

Described Elsewhere in This Issue